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RICHARD P. ROTHWELL, C.E., M.E.,
ROSSITER W. RAYMOND, Ph.D.,
CHARLES KIRCHHOFF, Jr., M.E., } Editors.

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Communications for Mr. RAYMOND should be addressed to ROSSITER W. RAYMOND P.O. Box 1465, New York. Articles written by Mr. RAYMOND will be signed thus * ; and only for articles so signed is he responsible.

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MESSRS. WELLS, FARGO & CO., on the first of August, opened for business with Mexico to all points on the Mexican Central, Mexican National, and Isola & Pachuca railroads.

M. ALEXANDRE POURCEL, the eminent metallurgist, who has contributed so much toward making Terre Noire one of the most famous steel-works of Europe, has resigned and has accepted the charge of the large steel-works which are now building at Bilbao, Spain.

WE regret to announce the death, at Real del Monte, Mexico, of WILLIAM SULLIVAN SCHLEY, M.E., a graduate of the Clausthal School of Mines. By industry and perseverance, after many years of faithful work under adverse circumstances, he had reached the point where he was just beginning to see a brighter future open out before him.

## GASES IN IRON AND STEEL.

The most lively and sustained controversy during the past few years in metallurgical circles has been that relating to the gases occluded and inclosed in iron and steel. Aside from the fact that iron-masters and steel-makers have learned to take a much deeper interest in researches formerly scorned as merely "theoretical," the direct bearing of the question at issue upon important practical points has contributed to make the controversy one which has been closely watched. We have repeatedly referred to the subject in giving an outline of the work of MÜLLER, PARRY, and others, and the more polemical writings of M. ALEXANDRE POURCEL, Dr. WEDDING, and a group of metallurgists who took a part in the discussion. Of late, few facts based upon experimental work have been brought forward, and the more recent contributions have not been remarkably profitable. Particular interest attaches, therefore, to the latest data gathered by that indefatigable worker in this field, Dr. FRIEDRICH C. G. MÜLLER, of Brandenburg, Germany. Following his example in the first installment of his paper, printed in *Stahl und Eisen*, we shall, for the present, confine ourselves to the presentation of a summary of his array of new data, leaving their discussion to a future period.

Iron and steel, like many other metals, possess the property of being able to absorb gases, their capacity to absorb hydrogen being greatest, while it is less for carbonic oxide, carbonic acid, and nitrogen. In chilling, a part of the gas escapes, giving rise to phenomena which destroy the continuity of the solid metal, and unfavorably affect its mechanical properties. Metallurgists are less interested in the cause than in the effect, and the porosity of steel, being a serious flaw at times, attracted study at an early date. The first efforts directed toward the remedying of the evil in this country, where Mr. W. R. JONES took the lead, were to prevent the escape of the gases by applying pressure during the process of solidification, a purely mechanical method, therefore. At Terre Noire, it was discovered that the addition of an alloy of silicon, manganese, and iron had a quieting effect upon steel, and the theory was advanced that this was due to the decomposition of carbonic oxide by silicon, it being accepted as a fact that blow-holes were caused by the entanglement of bubbles of that gas during the chilling of the steel. This theory was rudely shaken by the discovery that the gas in steel was chiefly hydrogen.

Mechanically, the form of the blow-holes was carefully investigated. A common form is that of porous tops, which is most easily dealt with. A more dangerous form is a core consisting of a series of cavities extending along the central portion of the ingot. A third kind of blow-holes is a large number of elongated fine horizontal cavities extending from the sides of the ingot toward its center.

There are two distinct phenomena producing unsound ingots. The first, which may be termed the "scintillating" of the steel, is due to an escape of gas from the metal at the moment of its solidification. This phenomenon does not necessarily cause unsoundness except in the top of the ingots, unless the escape of the gas in the central portion, chilling last, is cut off by the solidification of the upper part of the ingot. In that case, the ingot will show a core of blow-holes. The main point in casting such steel would therefore be to keep the top open for the escape of gas. The second, that of "rising" steel, is not accompanied by the expulsion of many particles of molten metal, but is characterized by the more or less rapid rising of the metal in the mold. The steel may appear to be completely quiet and dead in casting, and yet in solidifying will show the phenomenon noted, which causes the formation of the horizontal elongated blow-holes radiating from the sides to the center, honey-combing the entire ingot in extreme cases ; while in less pronounced instances the blow-holes are nearer the center, there being a thick solid shell around them. While steel may scintillate and at the same time show a tendency to rise, as basic steel sometimes does, the phenomena are apparently due to two entirely distinct causes. The rising is, according to MÜLLER, due entirely to the presence of occluded hydrogen, while the "scintillating" seems to be caused rather by the escape of carbonic oxide.

Dr. MÜLLER has added only a few analyses to those already published of the character of the gas in the blow-holes in ingot steel. But as these are of interest, referring to basic steel, we give them below :

ANALYSES OF GAS IN BASIC STEEL.

| | Quantity of gas. Per cent. | Carbonic oxide. | Hydrogen. | Nitrogen. |
|---|---|---|---|---|
| I. Soft, made with 2¼ per cent 35 per cent ferro. Scintillating. Rising a little | 36 | 0·6 | 85·4 | 14·3 |
| II. No final additions. Quiet. Scintillating little. Rising slowly. | 20 | 0·0 | 64·5 | 35·4 |
| III. Made with 5 per cent 14 per cent silicide and 2½ per cent 70 per cent ferro. Rising quietly. Ingot pretty sound | 22 | 0·4 | 86·4 | 12·7 |
| IV. Made with 5 per cent 14 per cent silicide. Rising quietly. Ingot solid | 6 | 0·0 | 54·7 | 45·3 |

It is worthy of mention that, in spite of the large additions of silicon and manganese in Nos. III. and IV., the steel had only traces of silicon and 0·4 per cent of manganese, while at least 0·3 per cent of phosphorus

was reduced. In another case, the percentage of phosphorus in the steel rose, after an addition of 5 per cent of silicide, from 0·106 to 0·515 per cent, while the silicon ran only 0·011 per cent.

Dr. MÜLLER's principal labors were, however, directed to the analysis of the gas escaping from the steel during the process of solidifying; the only attempt previously made in this direction being that of Mr. J. STEAD, of Middlesborough. Dr. MÜLLER at first collected the gas by using bottom casting and conducting the displaced and accumulating gas through a pipe in the closed top. This method yielded results that were not strictly correct, even after deducting the oxygen found and a four-fold quantity of nitrogen, as representing the air in the mold, because a part of the gas was probably consumed by combustion, so that the nitrogen is too high. In order to overcome this defect and get rid more thoroughly of the air, a second method was used. The ingots were cast from the top in the usual way, and then the remaining space in the mold was quickly filled with pure white quartz sand, thus displacing the air and preventing ignition of the escaping gases before they were collected. A clay cover was luted on top of the ingot and the gas collected through a pipe. The letter *b* affixed to the analysis will, in the following, denote that the gas was collected by the earlier; and the letter *t*, by the later and better method.

The gases escaping from chilling pig-iron were found to have the following composition:

ANALYSES OF GASES ESCAPING FROM PIG-IRON.

| | Carbonic oxide. | Hydrogen. | Nitrogen. | Carbonic acid. |
|---|---|---|---|---|
| Gray Bessemer pig | 37·3 | 58·3 | 0·5 | 3·9 |
| Spiegeleisen | 48·7 | 49·5 | 0 5 | 1·3 |
| Basic Bessemer pig | 39 6 | 46·8 | 10·0 | 3·6 |

The analyses of these grades of pig were as follows:

| *Pig:* | Carbon. | Silicon. | Manganese. | Phosphorus. |
|---|---|---|---|---|
| Gray Bessemer | 3·688 | 1·680 | 1·930 | ..... |
| Spiegeleisen | 4·180 | 0·253 | 7·370 | ..... |
| Basic Bessemer | 3·099 | 0·203 | 0·736 | 3·025 |

The fact that the gas gathered in pig-iron by drilling is high in hydrogen and nitrogen, but low in carbonic oxide, while the latter gas, as is shown, is found in a large percentage in the escaping gas, proves that pig-iron when chilling is incapable of retaining the carbonic oxide previously absorbed.

Bessemer steel made at Bochum, which in casting shows few signs of scintillating and rising, yielded gas of the following composition, the rail steel ranging between 0·23 and 0·28 in carbon, 0·15 and 0·25 in silicon, 0·5 and 0·6 in manganese, and 0·06 and 0·08 in phosphorus, while the spring steel carried from 0·48 to 0·53 of carbon, 0·15 to 0·25 silicon, 0·8 to 0·9 manganese, and 0·06 to 0·08 phosphorus.

ANALYSES OF GAS ESCAPING FROM INGOT STEEL.

| | Carbonic oxide. | Hydrogen. | Nitrogen. | Carbonic acid. |
|---|---|---|---|---|
| 1. Rail steel (*t*) | 37·3 | 47.3 | 7·9 | 7·5 |
| 2. Spring steel (*t*) | 34·0 | 49·5 | 8·6 | 7·9 |
| 3. Spring steel (*b*) | 45·9 | 41·4 | 9·9 | 2·8 |
| 4. Rail steel, first ingot | 38·7 | 51·3 | 7·2 | 2·8 |
| 5. Rail steel, last ingot. | 43·4 | 46·9 | 6·6 | 3·1 |
| 6. Solid spring steel, first ingot | 48·2 | 44·5 | 2·5 | 4 8 |
| 7. Solid spring steel, last ingot | 42·5 | 36·5 | 17·1 | 3·7 |

Analyses 4 and 5 and 6 and 7 were made to ascertain whether there was any change in the composition of the gas issuing from the steel, after remaining in the ladle for a time; and therefore the first and last ingots of a heat were examined, the result being a slight relative decline in the hydrogen and an increase in the carbonic oxide. In all cases, the metal examined made solid castings. In order to ascertain whether the gas was different in composition in porous steel, the following analyses were made: No. 1 rose slightly, it being possible to keep in the ingot by pouring water on it. No. 2 had to be divided. No. 3 rose very much. Dr. MÜLLER examined also Bessemer steel completely decarbonized before the final addition of spiegeleisen, which rose considerably and developed much gas, the two samples 4 and 5 being taken one after the other from the same ingot.

A parallel experiment was made with open-hearth steel, the sample being cast before recarbonization.

ANALYSES OF GAS ESCAPING FROM INGOT STEEL.

| | Carbonic oxide. | Hydrogen. | Nitrogen. | Carbonic acid. |
|---|---|---|---|---|
| 1. B. Rail steel, rising slightly (*t*) | 38·4 | 51 0 | 2·2 | 8·4 |
| 2. B. Rail steel, rising strongly (*t*) | 31·5 | 39·2 | 21·6 | 7·7 |
| 3. B. Rail steel, " " (*t*) | 70·7 | 20·7 | 6·5 | 2·1 |
| 4. B. Steel, not recarbonized, rising, first sample (*t*). | 18·6 | 54·2 | 24·9 | 2·3 |
| 5. B. Steel, not recarbonized, rising, second sample | 18·1 | 52·9 | 26·8 | 2·2 |
| 6. O. H. Steel, not recarbonized, rising, first sample | 48·0 | 35·1 | 15·4 | 1·5 |
| 7. O. H. Steel, not recarbonized rising, second sample. | 46·1 | 43·6 | 6·9 | 3·4 |

With the exception of No. 3, the gas of which approaches in composition that from basic steel, there does not appear to be any strongly-marked difference in the gas issuing from solid or from rising steel. It seems to be more a question of quantity, a point which Dr. MÜLLER promises to investigate. The analyses of steel cast previous to recarbonization naturally show a lower percentage of carbonic oxide, which, in open-hearth metal, is much higher, probably because the slow process of combustion of the carbon gives the steel a better opportunity to saturate with that gas; while, on the other hand, the cover of cinder on the bath prevents it from absorbing any great quantity of nitrogen and hydrogen.

Dr. MÜLLER'S most interesting results are those obtained with basic steel, where the gaseous products play a peculiar part. While the steel is comparatively quiet in the converter after the addition of spiegel, and ferro-manganese causes the formation of but little carbonic oxide, the escape of gas in the ladle is very violent. After it has been completely quieted in the ladle, it begins to agitate and scintillate in the ingot, and large quantities of gas escape from it until it is chilled. In spite of these phenomena, the tendency to rise is slight, and the most violently agitated steel generally yields pretty solid ingots. Mild basic steel, carrying from 0·05 to 0·10 carbon, 0·05 to 0·10 phosphorus, 0·45 to 0·55 manganese, and a trace of silicon, made by deoxidizing and recarbonizing with two per cent of 95 per cent ferro-manganese, yielded steel from which gas analyzed under Nos. 1 to 5 was obtained. Harder steel, 0·25 carbon, made with 8 per cent of spiegel, yielded No. 6, and a rail steel made with 10 per cent of spiegel gave two samples of gas taken from the fourth and the last ingot, nine minutes later.

ANALYSES OF GAS FROM BASIC STEEL.

| | Carbonic oxide. | Hydrogen. | Nitrogen. | Carbonic acid. |
|---|---|---|---|---|
| 1. Mild basic steel | 61·3 | 2·3 | 36·4 | 0·0 |
| 2. " " " | 57·5 | 4·7 | 38·0 | 0·0 |
| 3. " " " | 76·6 | 6·1 | 17·3 | 0·0 |
| 4. " " " | 50·9 | 5·1 | 43·3 | 0·3 |
| 5. " " " | 77·3 | 6·4 | 16·0 | 0·4 |
| 6. Rail steel, 0·25 carbon | 68·0 | 16·2 | 11·0 | 4·8 |
| 7. Rail steel, first sample | 56·5 | 33·0 | 8 6 | 1·9 |
| 8. " " second sample. | 62·0 | 34·2 | 1·0 | 2 8 |
| 9. Mild steel, first sample | 77 9 | 5·7 | 14·7 | 1·7 |
| 10. " " last sample | 62·6 | 12·6 | 23·2 | 1·6 |
| 11. Rail steel, first sample | 81·7 | 8·2 | 9·5 | 0·6 |
| 12. " " last sample | 54·1 | 38·6 | 3 5 | 3·8 |

As the escape of gas is particularly violent so long as the steel in the ingot is fluid, and decreases as it solidifies, Dr. MÜLLER took a sample after casting and when the ingot was setting, the results being given in Nos. 9 and 10 and 11 and 12. These analyses show that the frothing of the basic steel at first is due almost entirely to carbonic oxide, and that during the actual process of solidification the same gases escape as are taken from an ordinary Bessemer ingot. Particular interest, therefore, attaches to the examination of metal not recarbonized, whose contents of gas seem to vary considerably. The metal is often quiet and yields pretty solid ingots, and at other times it scintillates and rises considerably. Dr. MÜLLER believes that, if it is not too much over-blown, and if there is still 0·15 phosphorus in the bath, the metal without final additions yields a quiet ingot. No. 1 in the following table is a quiet steel, Nos. 2 and 3 two successive samples of a metal richer in gas:

GAS FROM BASIC METAL NOT RECARBONIZED.

| | Carbonic oxide. | Hydrogen. | Nitrogen. | Carbonic acid. |
|---|---|---|---|---|
| 1. Basic steel, quiet | 8·8 | 71·9 | 18·1 | 2·0 |
| 2. Basic steel, rising, first sample | 27·3 | 43·5 | 26·2 | 3·0 |
| 3. Basic steel, rising, second sample | 35·0 | 38·4 | 22·5 | 4·1 |

It would appear, therefore, that, previous to the final addition, the gas in the metal does not differ materially from that in the unfinished steel of the acid converter.

In view of the importance of the Terre Noire method of making solid castings, which has been introduced in this country, the action of additions of silicide upon basic steel are of special interest. Two cases have already been referred to. An addition of five per cent of melted silicide and two and a half per cent of melted ferro-manganese produced steel that was quiet, but showed a tendency to rise. It was unfit for use, being cold-short. Analysis showed that the percentage of phosphorus had risen from 0·106 to 0·515, while silicon was only 0·011. The addition, it is true, quieted the steel, but the reduction of phosphorus was too great. In order to limit the latter, another charge was worked by adding 5 per cent of silicide and 2 per cent of 70 per cent ferro-manganese, simply preheated to a red heat, to the metal when in the ladle. Analysis showed the following:

| | Carbon. | Silicon. | Manganese. | Phosphorus. |
|---|---|---|---|---|
| Before addition | 0·002 | 0·002 | 0·083 | 0·078 |
| After addition | 0·115 | 0·162 | 0 944 | 0·097 |
| Computed composition | 0 140 | 0·530 | 1·250 | ... |

The reduction of phosphorus was small only and the steel was quiet, but it rose and yielded unsound ingots. The gas escaping from the ingots in the two experiments had the following composition:

GAS FROM BASIC STEEL TREATED WITH SILICIDE.

| | Carbonic oxide. | Hydrogen. | Nitrogen. | Carbonic acid. |
|---|---|---|---|---|
| 1. Silicide added in converter, first sample | 64·6 | 18·9 | 14·4 | 2·1 |
| 2. Silicide added in converter, second sample. | 44·1 | 41·6 | 10·6 | 3·7 |
| 3. Silicide added in ladle, first sample | 34·7 | 58·0 | 4·1 | 3·2 |
| 4. Silicide added in ladle, second sample | 30·8 | 65 8 | 1·9 | 1·5 |

The experiments with silicide, while they certainly show the quieting effect of additions of silicon, do not prove that it leads to the making of solid metal.

Dr. MÜLLER concludes, from his analyses of the gas escaping from chilling steel of various grades and in different stages of manufacture, that the rising of steel is due to the escape of alloyed hydrogen, while the frothing and scintillating are the result of the escape of absorbed carbonic oxide gas chiefly. Basic metal previous to deoxidation and recarbonization contains chiefly hydrogen and nitrogen and little carbonic oxide, so tha

the metal when cast is quiet. As soon as spiegeleisen or ferro-manganese is added, carbonic oxide is formed in great quantity, the steel is saturated with the gas, which escapes partially in the ladle and partially while the steel is solidifying in the ingot. Other kinds of steel show a much larger proportion of hydrogen; but it might be thought, because the gas mixture escaping during solidification holds on an average about 30 per cent of carbonic oxide, that after solidification the contents of the blow-holes should show a similarly heavy percentage. Now, Dr. MÜLLER'S drillings have shown that, on the contrary, the gas in the blow-holes contains but little carbonic oxide, being a mixture of hydrogen and nitrogen. There is much force, therefore, in his conclusion that alloyed hydrogen escaping in the very act of solidification, in a manner similar to the crystallization of graphite in pig-iron, is the principal cause of the most dangerous form of porosity in steel, while carbonic oxide, which is expelled much more readily, is to be dreaded much less.

## CORRESPONDENCE.

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### The Black Hills of Dakota.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: It is not a light undertaking to reach this land of gold and now of tin as well as other metals. The traveler must accept the discomforts of a stage ride of two days and two nights; for there is no railroad on the east nearer than Pierre, on the Missouri River, and on the south than Sidney, on the Union Pacific road. The first is 160 miles distant, and the second 250 miles; yet the residents of the Hills generally prefer the longer route by Sidney, as there is less discomfort from freight inside as well as outside the stages.

From Sidney, the route is directly north, crossing in succession the east and west valleys of the North or main Platte, the Niobrara, the White River, and the South Fork of the Cheyenne. The "Plains" between these valleys have a gently rolling surface, stretching away on all sides as far as the eye can reach, an unbroken field of green grass, waving in the wind, and tempting the scythe of the mower. The gama-grass is unusually green and fresh this season; for the rains have been frequent, and it has not been eaten down. There are no herds of buffalo as formerly, nor even of stock cattle; for at this time of the year, the cattle are chiefly along the bottom or valley lands. Now and then, a few frightened antelope may be seen fleeing across the hills, as the stage rolls along.

#### EROSION OF PLATTE VALLEY.

When the road reaches the margin of the Platte Valley, there is a sudden change of scene. The broad stretches of prairie are broken by ravines leading into the valley, which is here clearly seen to be cut out of the general level or slope of the plains. It is well marked by the line of bluffs on each side; the edges of the horizontal beds of rock projecting in white cliffs among the growth of stunted pines. Standing on the edge of this bluff formation, the valley lies some six hundred feet below, and is nearly twenty miles wide. The opposite side is seen to be similarly walled in by bluffs, and when in the valley it seems to be bordered by mountains. The river flows here in a broad gravelly bed, and though fordable by stock cattle when not swollen by floods, it is crossed by a bridge a mile in length, the approach to which on the north end is guarded by a block-house fort on an island.

The geologist can not cross this broad valley cut out of the plain without being impressed by the enormous amount of material which has been removed from the general slope of the plains by this river, and similarly by the other streams flowing from the Rocky Mountains. The miner, accustomed to make calculations of tons of ore in a given length of vein, is tempted here to calculate the weight of material moved into the Missouri and onward to the gulf; but here he must deal with cubic miles instead of feet or tons. The transfer of such an enormous amount of material is a factor not to be lost sight of in terrestrial dynamics.

The road crosses also the upper portion of the Bad Lands, where the phenomena of erosion are well shown, and where the beds of clay have yielded up some of the most interesting fossils known.

The first view of the Hills is not particularly impressive as respects hight. The ridges are long, low, and dark, owing to the pine forests which cover them; but the central ridge has an irregular, serrated outline, and portions of it are quite bare and gray. This is the Harney range, the backbone of the Hills. It is essentially granite, and it is flanked on each side by mica schists, which are in turn overlain by stratified formations, from the Potsdam sandstone up. All these have been well described in the report by Messrs. Newton and Jenney. The crystalline rocks now, however, become more than ever before interesting and important, inasmuch as

#### TIN ORE

has recently been found in them, and in such quantities as to justify mining it. About the first of June last, Capt. A. J. Simmons, of Rapid City, received from some miners who were prospecting for mica masses of very heavy brown ore. Samples were sent to Mr. Gashwiler, in San Francisco, and submitted to Prof. W. P. Blake, who determined the ore to be cassiterite or tin oxide of good quality. A ton or two of specimens have been taken out. Assays by Price and by Mollitor and others show a percentage of from 35 to 60 of metallic tin. The locality has been examined recently by Mr. Blake, who finds the ore not only in massive bunches in a coarse granite vein, but disseminated in grains through a peculiar micaceous rock, and in a condition to be easily separated from the rock by crushing and washing. Considerable stream-tin has also been found, and the prospect is, that a very considerable amount of tin will soon be produced in this region. The Hills have several advantages for tin mining. There is an abundance of water for concentrating-works and a profusion of wood for charcoal to use in smelting. As soon as the right of way is obtained from the Indians, two or more railroads will connect the Hills with the railroad system of the Missouri Valley, and thus give cheap transportation and other advantages.

GLÜCK AUF.

DEADWOOD, DAKOTA, July 30.

## LAKE COPPER INTERESTS.

Special Correspondence of the Engineering and Mining Journal.

To the copper country your correspondent turned his steps a few days since, for a brief but pleasant pilgrimage. He found that the Huron had stopped hauling its rock across Portage Lake to the Pewabic stamps, and was now using its own mills, the economical but substantial construction of which reflects great credit on the mining superintendent, Mr. Johnson Vivian, who is now able to stamp rock as cheaply as any of his neighbors. In common with the Peninsula and Allouez, the Huron has now a bountiful supply of water for milling purposes, and, with its very complete equipment, has at last got a fair chance to demonstrate what it can do. The mine has not, in time past, made much headway in its cupriferous returns. It has worked nearly as many men as the Pewabic, while its mineral product has frequently been only about one third as great as that of its quondam benefactor. Its output for July was not far from twenty tons. Now that the Pewabic is free from its contracts to stamp the Huron ground, it will put in both shifts (two of its Ball heads instead of three, however) on rock hoisted from its own shaft. And this is quite opportune; for, while it must be acknowledged that the monthly average for the first half of 1883 is below the last half of 1882, yet it now looks as if the famous lean stretch is being left behind the present bottom levels, and that the mill will yet be needed at full capacity to deal with the profitable rock of the future. The Pewabic lowers its June record by about four tons in July, making an exhibit for the latter month of 64½ tons. The Pewabic has also been retarded by the necessity of using its skip for unwatering the mine; but adequate pumping facilities are now put in, and the skip will henceforth be devoted to its legitimate business. The bears may take another bite at this property when the next assessment is called in; but if the present outlook of the mine is not deceiving, and if copper hardens any under the pressure of London speculation, an ultimate and satisfactory rise in Pewabic may safely be taken as a foregone conclusion.

This leads to the remark that the future of copper is still problematical, despite the very satisfactory movement of mineral across the water, and is likely to remain so for some little time. The two or three London gentlemen who have heretofore manipulated the market in tin, and autocratically determined its price in both hemispheres, will find it dangerous to attempt a corner in copper, particularly when our Western mines are sending their products out with so much energy to foreign markets. I notice that the London *Iron Monger*, in a recent and careful estimate concerning the total American supply for 1883, corroborates in all its details the figures arrived at in my independent calculation made in May, and published in the ENGINEERING AND MINING JOURNAL of June 2d. For the sake of accuracy, it ought to be said that both the *Iron Monger* and your correspondent were a little high on the amount left over from 1882, as I now know indirectly from the Eastern syndicate which holds the exact figures of the matter in hand, and which figures are secret. This simply gives lee-room for confidence in my estimate of 72,000,000 pounds as the consumption of 1883, but in no respect lessens the quality of the deductions of my ancient letter. It is not altogether ungratifying that the present outlook should fulfill, in such minute details, the position at which your correspondent arrived in the early months of the calendar year. After a careful study of the facts as they were presented in my letter of June 2d, the total American production for 1883 was placed at 147,000,000 pounds. From a very careful computation, "Refiner," in his letter of August 11th, states that the total product will be 145,000,000 pounds. But this is on a basis of 55,000,000 as the output of the lake mines. This, I am convinced, is wrong. "Refiner" bases his calculations on the reports of the leading mines for June only, while, for the first six months—more, the first seven months—the output of each one of the five largest reporting mines, together with the Osceola, which has not reported, has presented an increase which in the aggregate amounts to not less than 800,000 pounds, at which rate (and it will not fall below it, since the Calumet & Hecla is somewhat handicapped by changing its plant of stamps and Leavitt patterns), it will certainly not fall below 1,500,000 pounds increase for the twelve months of this year. The Pewabic, Grand Portage, and Conglomerate have fallen off a trifle (the last having suspended milling operations until the completion of the new stamps at Lac la Belle); but the Copper Falls, Huron, and Central have, as a whole, gained in higher ratio, while the Peninsula and Wolverine have already sent out 1,000,000 pounds, and in future operations will raise their own record by a very comforting trifle.

The figures already advanced will raise "Refiner's" figures to my own, and thenceforth our reasoning is parallel. Your correspondent now puts the output of Lake Superior at 59,500,000 pounds, though it may fall short by half a million—certainly not more. After all is told, it is safe to say that, after the home demand is supplied, there will be 75,000,000 pounds yet waiting, which your correspondent said must be carried over as the crushing incubus on the trade of 1884, or have the gates lifted which open into foreign seas. This latter has been done; 30,000,000 pounds have already found a market there, and, if prices stay up, 10,000,000 more, says "Refiner," must go. This is all your correspondent ever set out to prove; and in their essential points, at least, the figures of June 2d may, he modestly thinks, be taken as foregone conclusions. If, therefore, the London syndicate can corner the market, or is even able to dictate prices to any extent, the price of several lake mines will vault into higher planes, and the land of dividends, which now seemeth afar off, will suddenly draw nigh. The uncertainty lies in our exports, and a Damocles sword may cut that escape off, if the syndicate, failing to be sanguine of accomplishing its purposes (when the possibilities of the Montana and

Arizona mines are taken into account, to say nothing of the Spanish mines, which have exhaustless reserves already opened), should once begin to unload on the market. This brings us back from our interpolated meandering to the Pewabic.

From what data are just now accessible, the price of stock in reputable iron mines has suffered little collapse on account of the glut in iron, and it is passing strange that such a calamity should overtake the Pewabic, which once sold for over fifty dollars, and which now has every appearance of sinking into rich areas. However, the small number of shares that have changed hands among Portage people shows that the stockholders here intend to stand by the mine, and the entire sentiment of the best miners, as far as your correspondent could get at it, is, that a revival warranted by the facts will set in in Pewabic in the not distant future. But this, of course, is provisional, and, like all other prophecies where bulls and bears gore and hug, must not be taken for more than it is worth. The Franklin is truly looking well underground, is increasingly regular in its productiveness, and is remarkably cheap at present rulings. The record for the first six months shows a marked advance over the splendid returns of 1882, and over 350,000 pounds over the first six months of 1881. The Grand Portage is not trying to do very much, and is succeeding very well in its undertaking. Another of the smaller mines is straining at a gnat hard enough to swallow a camel; but these efforts only facilitate the disease which threatens to carry off the patient, provided, of course, no stimulant in the way of an assessment is handed in by those interested in the survival of the concern. The Quincy is clearing the way for a new boiler-house at the mill. It lately completed a new dock, which forms an excellent bulkhead against the discharge of its sand into the lake, and which is a material advantage to the shipping facilities of the harbor.

Let me observe, *en passant*, that the sand deposited as "tailings" from the stamp-mills is a matter which may well receive attention from the next Congress, since Portage Lake is a national highway, and the encroachments of the tailings, particularly from the Franklin mills, have pushed their way nearly if not quite half-way across the lake. There is no immediate danger to navigation, and proper caution will obviate any danger for the next generation. The report of Messrs. Schermerhorn and Roberts, of the Engineer Corps of the United States, estimates the amount of sand discharged into Portage Lake as being in excess of 3,500,000 cubic yards. This report shows that the "tailings" are a formidable matter, and ought to be regulated by a power superior to and independent of the mining corporations. A spirit of petty jealousy threatened to make the discharge of the Franklin stamps the entering-wedge of a serious controversy; but a quietus was administered an officious official, and the location of this bank as the site of a draw railroad bridge will remove from the Franklin the possible incubus of a serious litigation and obstruction. Next week, we shall start overland for the mines of Keweenaw, and by water for those of Ontonagon.

SPECULAR.

## THE FRISBIE CLUTCH AND ITS USE IN HOISTING-ENGINES.

Clutches of various forms are gaining in favor, as applied to hoisting engines, for a large variety of purposes. Among those which have of late been introduced in connection with mine hoisting is the clutch designed by Messrs. D. Frisbie & Co., of Philadelphia. The leading features of its construction may, in a general way, be best described by references to the cut-off coupling shown in Fig. 1, the modifications used for hoisting-engines embracing only such minor changes as are called for by the exigencies of each special case. On the driving-shaft on the right in our figure, is mounted a sleeve, the motion of which is, by the compound levers shown, transmitted to the bevel-headed bolts, held in position by an arm keyed to the shaft. If, through the pressure exerted by the position of the compound lever, the sides of the bolt-head are forced against the V groove, the other shaft is carried along. As the length of each bolt is adjustable by means of the nut, each single one can be adjusted to suit the load, while the power of the clutch is illustrated by the fact that a twenty-eight inch clutch, said to be the largest in use in this country, has been used to move 90 tons on the Harlem River draw-bridge.

The application of the Frisbie clutch to hoisting-engines is shown by the sketch, Fig. 2, which is a horizontal section through a drum driven by belt, though, of course for longer distances wire rope is substituted. One end face of the drum carries the V groove, against which the bevel-heads of the bolts are pressed through the action of the levers, the projecting ends of which slide along the inclined surface of the cone when the latter is moved toward the drum by means of the simple lever shown. The drum of course moves freely when the clutch is off, and may be held in any position desired, by a brake. An end view of the machine is shown in Fig. 3, in which only one arm and bolt are drawn, to prove that the friction surface is large and can be easily adjusted. The Frisbie clutch is now applied on drums at Lake Superior copper mines and in Leadville mines.

## THE SMELTING OF ARGENTIFEROUS LEAD IN THE FAR WEST.*

By O. H. Hahn.

*Early Attempts.*—Twenty years ago, the smelting of argentiferous lead ores was an unknown thing in the far West, under which collective name the States and territories west of the Mississippi River are generally known; and although there were persons to be found in the mining districts who were familiar with the methods of smelting current in European countries, the first attempts in this branch of the metallurgical industry were failures, because the appliances used and the grade of the ores to be treated were not adapted to the requirements of the localities of that vast yet sparsely settled stretch of country, then entirely devoid of cheap transportation facilities. Who would ever think nowadays of building a Flintshire or a Carinthian furnace, or a Scotch hearth, or a Mexican "chacuaco" in the wilds of Nevada or in the Rocky Mountains, to smelt lead ores? Yet such was the apparatus first resorted to in the beginning of our smelting industry, evidences of which may still be found in the ruins of Galena (Washoe County) and Washington districts, Nevada; in the Patagonia Mountains of Arizona; in Little Cottonwood and Rush Valley, Utah; Cerro Gordo, California; and other localities. It seems that the early smelters did not calculate the cost of their product, or imagined that they were operating on the sea-coast, where fuel, labor, and every thing else are cheapest.

The first smelting-works with an appearance of success sprang up near Helena, Montana, and at Oreana, Nevada, a station on the line of the Central Pacific Railroad, in 1866 or 1867. In both places, the ore treated had a sufficiently high silver tenor to leave a margin over and above the cost of working it and the expense of transportation of the silver, which is no small matter, if we consider that not only had the ores to be smelted, but the resulting bullion had to be calcined and cupelled on the spot to obtain the silver in salable shape. For the lead, or litharge rather, there was no market in those days, all wants being supplied more cheaply by the Missouri and European producers. The year 1869, when the two great Pacific railroads were united to form an uninterrupted line of communication between San Francisco and New York, the great commercial centers of the East and West, gave the signal for the beginning of smelting operations on a more extensive scale than heretofore, and for the gradual expulsion of foreign lead from our markets. Till then, mines producing "cooking ores," as lead ores were scornfully termed at that time, did not find ready purchasers, especially as those ores generally occurred in limestone formations, which were then considered as very unreliable ore producers. But the success of the firm of Buel & Bateman, who had bonded the mines now known under the name of the Eureka Consolidated, and who turned a perfect stream of rich bullion from two small furnaces on to Balbach's refinery at Newark, New Jersey, wrought a sudden change. Lead mines, good, bad, or indifferent—but "true fissure-veins" they must of necessity be—were at a premium, and smelting-works sprang up like wild-fire everywhere. The nucleus of excitement, however, centered about Salt Lake City, whose neighboring mountains were known, from the explorations of the Mormons and the soldiers of General Conner, to teem with lead ores. The comparative poverty of the ores in silver, their siliceous and frequently refractory character, the close competition in their purchase, the bad quality of the fuel and furnace lining, and a good many other things, sharpened the intelligence of the Salt Lake Valley smelters, more so than that of others; and it is to them that we owe the introduction of improvements which led to a more economic handling of the ores. Iron ore and limestone were here used intelligently as fluxing material for the first time; Connellsville coke superseded, at least partially, the miserable charcoal which was made from the light woods of Utah; water-jackets replaced the out-walls as well as the costly fire-brick lining of the furnaces; dust-chambers were erected to save the escaping finest particles of ore; and a number of very complete sampling-works were erected, which opened a liberal market to the miner and afforded the smelter an opportunity to select for purchase such ores as suited his wants. It is true, Eureka, Nevada, has been, so to speak, the cradle of the art of smelting in the West; to Arents we owe the introduction of the siphon tap, the construction of the first large and successful furnaces, and the reintroduction of the boshes in lead furnaces; but beyond these, Eureka does not offer any innovations in the smelting process itself. The same routine is observed there as of old. The principal reasons for this conservatism are, first, the docile character of the predominant ore (of Ruby Hill), which requires little or no flux to give economically satisfactory results; and, secondly, the fact that mines and smelters of the leading companies are managed by the same person, generally a miner or a business man who is reluctant on general principles to adopt improvements of a scientific nature.

*Recent Progress.*—In localities where mines and reduction-works are not united under one head, and where, on the contrary, the miner sells his product to the smelter who pays him the most money, there is no room for nursing prejudices. Business, art, and science have to go peaceably together; and it is owing to the co-operation of these three factors that we are progressing day by day in search for the most profitable methods in the art of smelting.

*Silica Percentage of Slags.*—It is taught in the mining schools that in smelting lead ores the object is to make a singulo-silicate slag, or one between this and a bisilicate, of the earthy matter in the ore, which best enables us to effect its separation from the metallic matter; it is also taught that simple singulo-silicates are not as easily fusible as compounds of two or more singulo-silicates; for instance, a compound of the singulo-silicate of ferrous oxide with that of calcic oxide. It was further known in practice for a long time that if, in fluxing an ore, the proportion of lime to oxide of iron is kept as one part of the former to two parts of the latter, a good slag would be the result; that is, one which will form with the least amount of fuel, keep the furnace open, and be free from lead and silver. But, with all this knowledge, more bad slags than good ones were made, till several thinkers were led to the right track by giving their attention to crystallized slags, which presumably are real chemical compounds, and therefore have a constant composition, while amorphous slags might be considered as mere mixtures of different silicates or solutions of one silicate in another. It was observed that some crystallized slags behaved better than others in the furnace. If such a slag, then, could be made at will, a great problem was solved; any kind of ore could be smelted without the least trouble by giving it the lacking constituents in the same ratio as they are found in the analyzed slag. This necessitates, of course, an accurate knowledge of the slag-constituting ingredients of ore, fluxes, and ash of the fuel, which can only be arrived at by chemical analysis and an accurate weighing of all the material into the furnace. Taking all these precautions, a slag of the same crystallization as the typical one will almost invariably result, other things being equal. I say "almost invariably," because oxide of zinc seems to prevent crystallization; at least, such was my experience in Colorado. The slag-forming matter of an ore which has to be most frequently dealt with in lead smelting consists of the following substances:

1. Silica.
2. Alumina.
3. The oxides of iron and manganese.
4. Lime and magnesia.

Baryta and strontia are of rarer occurrence, and the oxides of the alka-

* From advance-sheets of *The Mineral Resources of the United States*, published by the United States Geological Survey, Department of Industrial Statistics. Albert Williams, Jr., Chief of Department.

line metals exist only in such subordinate quantities that they may be neglected.

All the above-named substances are hardly ever found present in the same gangue, and much less arranged in such a proportion as to yield at once a suitable slag in smelting. By supplying the ore with the deficient ingredient, we *flux* it and form a "smelting mixture." According to the amount of combined silica present in a slag, we distinguish three degrees of acidity:

1. Subsilicates, in which the oxygen of the bases is to the oxygen of the acid as 2:1—

$$4RO+SiO_2=R_4SiO_6 \text{ ; or } R_2O_3+SiO_2=R_2SiO_5.$$

2. Singulo-silicates, in which the oxygen of the bases is to the oxygen of the acid as 1:1—

$$2RO+SiO_2=R_2SiO_4 \text{ ; or } 2R_2O_3+3SiO_2=R_4Si_3O_{12}.$$

3. Bisilicates, in which the oxygen of the bases is to the oxygen of the acid as 1:2—

$$RO+SiO_2=RSiO_3 \text{ ; or } R_2O_3+3SiO_2=R_2Si_3O_9.$$

*Subsilicate Slags.*—The subsilicates are not made at present, at least not intentionally, on account of their evil behavior; but they are mentioned because they may be used as a flux on account of their capability to saturate themselves with silica. The subsilicates of alumina and those of the oxides of the alkaline earth metals are infusible; but the subsilicate of iron is very easily fusible, and at a lower temperature than singulo-silicates. It has a high specific gravity, runs very thin, solidifies very rapidly, and has a bluish metallic luster and fine-grained texture. It forms accretions in the furnace hearth, causes the furnace to blaze, and entangles metallic particles. It also has a highly corrosive action on the masonry of the furnace.

*Bisilicate Slags.*—Bisilicates are not made in this country, to my knowledge, except unintentionally, as there are no furnaces of sufficient hight to make them without evil results. Those highly siliciferous slags, which Mr. A. F. Schneider describes in Vol. XXXIV., page 283, of the ENGINEERING AND MINING JOURNAL, are still singulo-silicates, because the combined oxygen of all their bases is to that of the silicic acid as 1:1. Bisilicates have a glassy flow and generally a black color, and do not *often* crystallize, as we glean from the latest metallurgical publication (Balling's *Compendium der Metallurgischen Chemie*). It appears from analyses quoted in metallurgical books that they always carry considerable oxide of lead, which is probably due to their faulty composition.

The most interesting slag to the lead smelter is the *singulo-silicate*. A typical one of the form $6FeO,3SiO_2+4CaO,2SiO_2$, in which the percentage proportion of oxide of calcium is to protoxide of iron as 1:2, has been

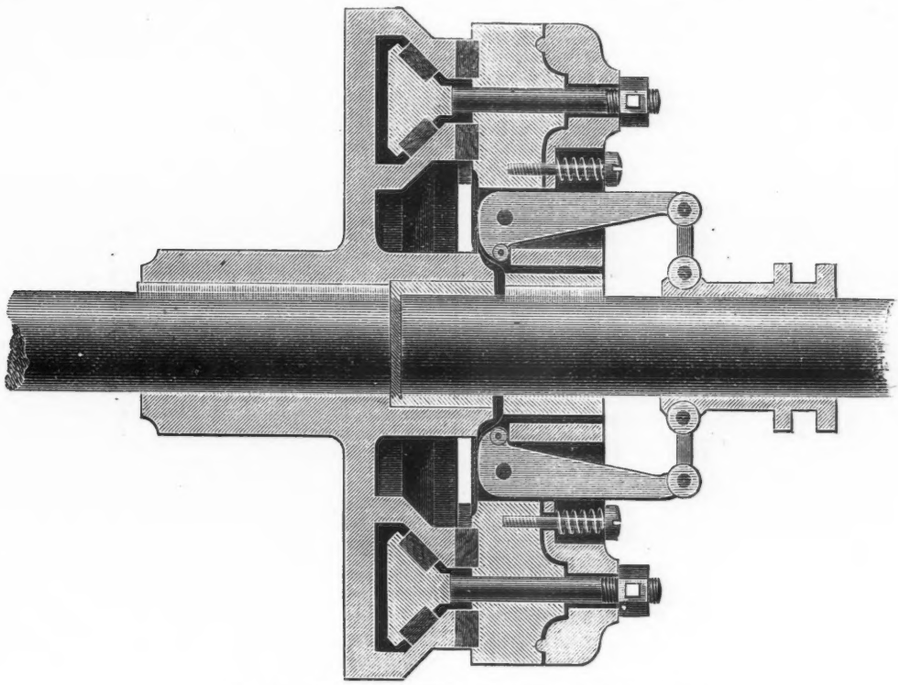
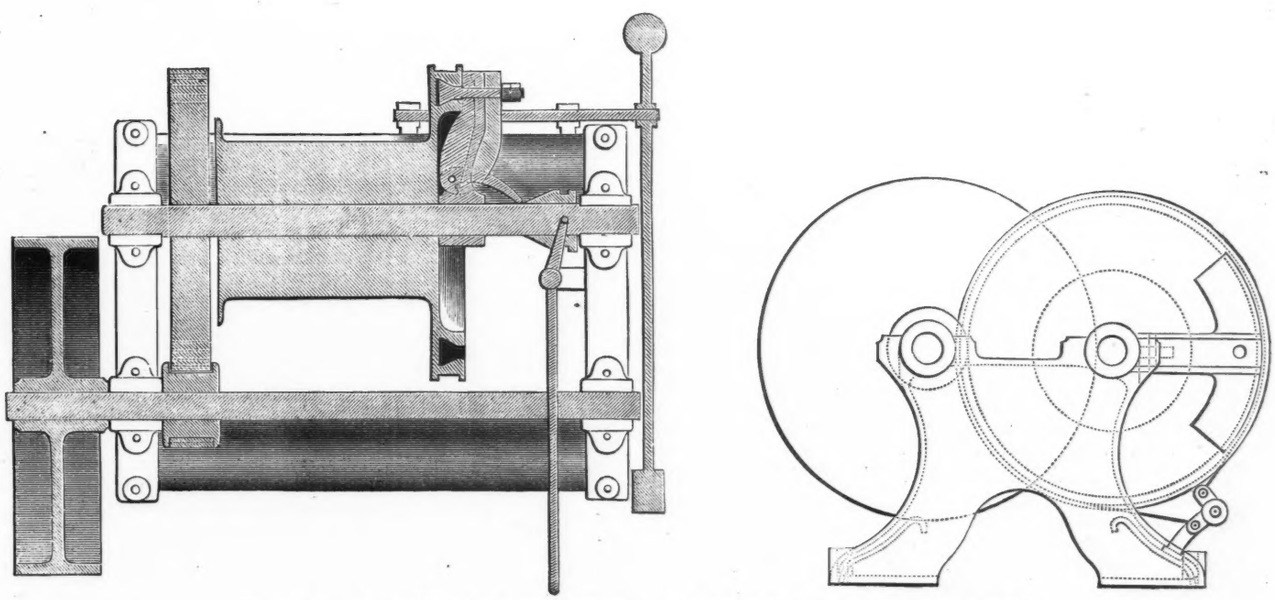


Fig. 1. **THE FRISBIE CUT-OFF COUPLING.**



**Figs. 2 and 3. THE FRISBIE CLUTCH AS APPLIED TO A HOISTING-DRUM.**

long known, and has nevertheless not been often made, if we may judge by the analyses published in metallurgical papers, until Mr. A. Eilers, and probably a few other metallurgists, recognized its great virtues. This is a most magnificent slag; its physical appearance in the slag-pot is so marked that one who has once seen will never forget it. If the proper amount of fuel has been given to the charge, it will contain neither lead nor silver; and it is my opinion that if it ever is metalliferous it is through small globules of matte dissolved in it, which have not been separated on account of lack of heat in the furnace. Running on such a slag, a furnace can never get out of order except through gross carelessness. It is, however, the duty of the metallurgist to correct the slag if it shows imperfections; for instance, if it shows an excess of iron, a lack of silica, etc. An addition or a reduction of a few pounds of one flux or the other will show itself in the appearance of the new slag as soon as it gets down to the hearth. This explains why, in throwing the charge into the furnace by volume, and not by weight—the old "shovel system"—a typical slag (that is, one of a fixed composition) can not be obtained. Each pot of slag running out of the furnace will differ from the preceding one; and if the furnace becomes deranged, it may be impossible to perceive what caused the trouble. On breaking a cake or cone of slag as it comes out of the pot, after cooling, it will show cavities filled with large crystals. Unfortunately, they are never entirely developed, so that one can be able to determine to which crystallographic system they belong.

*Various Slag Components.*—Heretofore, we have assumed that a slag is only composed of silica, iron, and lime. An ore or a flux may, however, contain notable quantities of other substances which would play an important part in the formation of a slag, such as manganese, magnesia, etc. Experience has shown that manganese acts analogously to its related metal, iron; magnesia, baryta, and strontia to lime. In the case of alumina, we have to make the slag more acid by an amount of silica corresponding to the alumina, according to the formula of a singulo-silicate, namely, $2Al_2O_3.3SiO_2$; otherwise, we should obtain too basic a slag. It is obvious that a slag of the above composition, needing so much lime, would make the treatment of some kinds of ore, such as carry much ferruginous or manganous matter, very expensive, inasmuch as it reduces the percentage of ore in the smelting charge very considerably. This point occupied the attention of Mr. Eilers while treating the ferruginous ores of the Flagstaff mine in Utah; and after much labor and many sleepless nights, he succeeded in making a slag which very nearly corresponds to the formula,

$$6FeO,3SiO_2+2CaO,SiO_2,$$

and in which the proportion of calcic oxide is to ferrous oxide as 1 : 4. The physical appearance of this slag is still more striking than that of the first one; it is simply beautiful, and it crystallizes also, but in a different system. It has a black color, frequently with a rusty brown film, and a fibrous texture. It fills all the requirements of a good slag, metallurgically as well as commercially, but it is not quite as free from lead oxide and silver as the former. It keeps the furnace open (that is, free from hearth accretions), and is especially adapted for smelting ores containing a large percentage of zinc, this greatest enemy of the lead smelter. Oxide of zinc makes a slag difficult to fuse, and silicate of zinc is infusible; but both dissolve readily in an excess of the slag just described, while the more calcic slag becomes much less fluid. In other words, ferrous oxide increases the liquidity of zinciferous matter, while lime decreases it.

If the proportion of ferrous oxide is raised beyond the limits just given, but at the same time the degree of acidity corresponding to a singulo-silicate is maintained, the remarkable fact is observed that the slag becomes rich in lead oxide. In consequence of this, its physical appearance changes entirely. It shows a blueish hue and waxy luster in its fracture, runs like stearine, and forms hard accretions in the furnace-hearth. This slag was formerly made at some works in Leadville, at which the necessity of using lime in their smelting mixtures was decried, and thus a great waste in lead and silver resulted.

The lack of iron in the Utah ores, and the great cost of iron flux as compared with limestone, induced prominent Utah smelters to search for a type of slag in which the proportion between lime and protoxide of iron is greater than one of the former to two of the latter, and they seem to have succeeded very well. I have seen a sample from the Horn-Silver works which had a color like stove polish, a greasy luster, and well-formed crystals in its cavities. Schneider gives its percentage composition as follows:

| | |
|---|---|
| $SiO_2$ | 35 |
| FeO | 25 |
| CaO | 26 |
| $Al_2O_3$ | 10 |
| Not determined | 4 |
| | 100 |

This would respond to the formula,

$$6FeO,3SiO_2+8CaO,4SiO_2+2Al_2O_3,3SiO_2.$$

As will be observed, there is a large amount of alumina in this slag; and it might, therefore, be questioned whether such a slag could be made if alumina were lacking.

*Estimation of Slags.*—In the early stage of smelting at Leadville, great difficulties were encountered at most of the works in making a good slag, and the "muscular" method had to be frequently resorted to in freeing the furnaces from sows. This evil was in great part due to disregarding the alumina contained in the ore; and also to the manganese, which was not regularly determined on account of the tedious methods then in use. The result of this oversight was a very basic slag, which would naturally close up the furnaces. Mr. T. Macfarlane, in a paper read before the American Institute of Mining Engineers, suggested that, by determining the specific gravity of a slag, a clue might be obtained for improving it if not correct. If the specific gravity were higher than that of the typical slag, this would prove an excess of the bases of the heavy metals in the faulty one. But whether it required an addition of silica, or of lime, or of both, the determination of the specific gravity could not tell us. In the case of a slag which is far out of the way, correct chemical analysis alone, however tardy it may be, can give us information. Since the introduction of more rapid volumetric methods for the determination of manganese (for example, Guyard's), and the estimation of the alumina in slag computations, all troubles of this nature have ceased.

A fact to which Dr. Iles, of the Grant Smelting-Works, now at Denver, first called attention, and which it appears might be turned to account in correcting a slag, is the behavior of its powder under the magnet. Some slags are highly magnetic, while others are not. Would this not indicate that magnetic oxide is dissolved in the slag, which has escaped reduction to ferrous oxide, and thus causes a waste of precious flux?

*Elimination of Sulphur, Arsenic, Antimony, etc.*—The subject of slags has been dwelt upon at some length, because the metallurgical success of smelting depends in a great measure upon their composition, and it may be said *altogether* in the case of cerussite ores. But as soon as sulphur, arsenic, antimony, and other electro-negative elements enter into the composition of an ore, this alters the case; we have to eliminate them in some other manner before we can extract the pure lead without difficulty. There are two ways of doing this:

1. By precipitation by means of metallic iron.
2. By roasting the ore.

*Precipitation by Iron.*—The iron-precipitation process is only applicable to galena ores and lead ores contaminated with small quantities of the sulphides, arsenides, and antimonides of other metals, to which should be added all sulphates, arseniates, and antimoniates, as they are reduced in the furnace to sulphides, arsenides, etc.

This process is based upon the fact that iron has a greater affinity for the electro-negative elements than lead and silver. If, therefore, iron is brought in contact with molten sulphide of lead or silver, it will, as soon as it has acquired the proper temperature, combine with the sulphur, while lead and silver are set free as reguline metals. The affinity of silver to sulphur is, however, stronger than that of lead, which is the reason why some sulphide of silver is undecomposed, remaining with the sulphide of iron.

The compound of iron and sulphur is metallurgically called a *matte*, while that of iron and arsenic or antimony is termed *speiss*. The latter has a higher specific gravity than the former, which is the reason why, if both are produced during a smelting operation, the matte floats on top of the speiss. The mattes retain more silver than the speisses, while with gold the case is exactly the reverse. Lead enters the speiss only in the metallic state in the form of shots, while in matte it will be present as sulphide. Copper enters into either as sulphide and arsenide respectively, as it has a strong affinity for both sulphur and arsenic.

The iron may be present in a matte either as diferrous sulphide ($Fe_2S$) or as ferrous sulphide (FeS), but never as ferric disulphide ($FeS_2$), because the latter, on being exposed to a strong heat, is decomposed into magnetic sulphide and free sulphur. The former does not fuse well; it is mushy and liable to chill in the furnace, thus forming an accretion. It is therefore well to aim at making ferrous sulphide (FeS) in computing a charge. If copper be present in a lead ore, it will go into the matte as cuprous sulphide ($Cu_2S$). On the strong affinity of copper for sulphur is based its separation from lead. Iron and other heavy metals combine with arsenic in a great many proportions, according to the statements of metallurgical authors, who speak of

$$R_2As,R_3As,R_4As,R_5As, \ldots\ldots R_nAs.$$

Yet experience has taught the practical smelter that only crystalline speisses of a bloomy texture, similar to that of spiegeleisen, from $R_5As$ toward $R_nAs$, will work well in the blast-furnace. Speisses from $R_4As$ on toward $R_2As$ run very thick, if at all, and form hard accretions (speiss sows) in the furnace. They are fine-grained, and always contain entangled metallic lead. An addition of metallic iron will therefore improve the liquidity of a speiss. How far we can go in augmenting the proportion of iron to arsenic, I am unable to state from my own experience; yet it may be surmised that an excess of iron in a speiss may be just as injurious to the operation of a furnace as an excess of arsenic.

Purely antimonial speisses have never come under my observation, so I can not say any thing about them.

*Form in which Iron is used.*—As it is not easy to obtain metallic iron in every locality, and as it is generally not in a proper shape for being weighed out and mixed accurately with ore and fluxes, it is preferable to supply the iron as a desulphurizer in its nascent state, in which it can be obtained by using a properly constructed furnace and making a slag of sufficient acidity, at the same time adding so much ferruginous matter to the smelting mixture as will correspond to the amount of metallic iron required for the saturation of sulphur, arsenic, etc. Furnaces with straight walls from top to bottom are poor reducers, while those provided with boshes operate very well indeed. Basic slags are not good reducers either, because they form at a temperature at which iron is not reduced; they will therefore merely mechanically dissolve the magnetic oxide which forms out of the additional ferruginous matter in the upper part of the furnace.

From the preceding remarks, it may be inferred that this process is not a perfect one, because it gives rise to the formation of intermediate or by-products which contain gold, silver, and lead. If thrown away, these metals will be lost entirely. If we wish to extract them, additional processes will have to be resorted to, and then the question arises, Will it pay? It is therefore advisable to subject only such ores to the iron-precipitation process as contain a minimum of sulphur, etc. What the maximum should be, can be determined by the local price of the iron flux compared with the cost of roasting.

*The Roasting Process.*—By roasting an ore, we wish to expel its sulphur, arsenic, or antimony, and convert the metals in it into oxides, in which form they are best adapted either to be carried into the slag or into the metallic state during the subsequent smelting. The roasting is carried out by exposing the ore to the action of heat and air, in consequence of which sulphur, arsenic, and antimony are volatilized as sulphurous, arsenious, and antimonious anhydrides, respectively, while the metals remain in the oxidized state. According to the apparatus in which the operation is performed, the result will be more or less complete. The roasting of arsenical and antimonial ores is rendered more difficult by the simultaneous formation of arsenic and antimonic acid, which combine with the metals to form arseniates and antimoniates. These compounds can only be decomposed by repeated additions of carbon and access of air, whereby the arsenic and antimonic acid are reduced to their arsenious and antimonious anhydrides and thus gradually volatilized.

Ores containing sulphide of zinc (zinc-blende, sphalerite) are also difficult to desulphurize by roasting, inasmuch as zincic sulphate is always

forming, which is only completely decomposed in a white heat. Mr. Stetefeldt found that sulphate of zinc is the most constant compound in the fire next to sulphate of manganese. While during the first two hours of roasting nearly all the sulphate of iron had been decomposed, there was still a large percentage of zincic sulphate undecomposed at the ninth hour. This behavior of zinc makes zinciferous ores difficult to work. In the blast-furnace, any sulphate of zinc remaining undecomposed after roasting will be reduced again to sulphide. This substance goes partially into the matte, if any is forming, partially into the slag, which it makes thick and stiff; it also carries silver along, and thus gives rise to losses above and beyond those inherent in all metallurgical processes.

*Roasting-Furnaces.*—With regard to the apparatus used for roasting, preference is given in this country to reverberatories, ranging from 30 to 40 feet in length and from 10 to 12 feet span, divided into four or five hearths. This arrangement admits of keeping four or five charges in the furnace, in as many different stages of treatment. As soon as one charge is drawn, all the preceding ones are moved forward one by one, and a fresh charge is put in. The time of roasting varies with the amount of sulphur in the ore, the bulk of the charge, the quality of the fuel, and also with the altitude of the locality above the sea-level. The size of the ore has a great influence upon the completeness of the desulphurization, and the more zinc-blende there is in it the finer it should be. At Robinson, Colorado, for instance, the ores could not be crushed finer than walnut size; and although a charge of 1300 pounds remained in the furnace for thirty-six hours, there was still from 7 to 8 per cent of sulphur left in the ore. The ore being highly zinciferous (21 per cent ZnS), the slag resulting from smelting contained considerable silver. From Przibram, Bohemia, it is reported that blende ores have been roasted down to one per cent sulphur.

If copper is present in an ore, there should be sufficient sulphur left in the charge to get rid of it as matte; otherwise, it will deteriorate the quality of the lead or be lost in the slag. Galena ores almost free from other sulphides roast better in a short furnace than in a long one, especially if the fuel does not yield a long flame.

For subsequent smelting, it is more convenient to have the ore in lump shape than in powder. Wherever, therefore, it is practicable, as in the case of ores with a large percentage of lead, to slag the ore, in other words, to convert it into silicates, it should be done. This slag should be drawn, and after cooling broken up into lumps of suitable size. As zinciferous and ferruginous ores can not be slagged very easily, it will be sufficient to sinter or "agglomerate" them.

Wood is used as fuel in places where its abundance makes it cheaper than stone coal, and it is preferable when it is of a resinous character. Mineral coal is, however, preferable to oak, mahogany, mesquite, or the lighter woods.

*Matte Roasting.*—In the foregoing outline, it has been observed that, whenever there is any sulphur in a smelting mixture, it has to be saturated with the necessary quantity of iron to form a matte of the right composition. To extract the lead and silver which these mattes retain, it is necessary to roast or calcine, and afterward flux and smelt them exactly in the same manner as an ore. If they are so poor in lead that there is danger of its being kept entangled in the slag and thus lost, it is advisable to add plumbiferous ores or products in sufficient quantity to effect a complete separation of lead and slag in the furnace. A charge containing 10 per cent of lead will be safe to answer this purpose, yet it is possible to obtain the same result with as little as 6 per cent. The question now arises, Will it pay to roast matte in a reverberatory, as it costs something to reduce it to powder besides the roasting itself? If the matte is rich in silver, it does; if not, then it requires close figuring of all expenses. I have known localities where poor matte was roasted in heaps. The only preparations it needed were coarse crushing, a bedding of wood to pile it on, and setting it on fire. The crushing is easy enough after it has been exposed for a while to atmospheric influences, which cause it to crumble. But the calcination is extremely tedious, as it will burn for a month or more, and then the whole pile will have to be turned over to assort the well-calcined stuff from the half-calcined and crude matte, from which a new pile or heap has to be formed. These manipulations have to be repeated till no more crude matte is left, and it will take months before that result is achieved. However well this matte may be roasted in heaps, it will always contain from 7 to 8 per cent of sulphur, which in the following smelting operation will cause another matte to be formed. It appears to me that this mode of roasting is not worthy of imitation in a progressive country where time is an object, and I find that most smelters take the same view. They are simply laying aside the poor mattes for a time when these may be reduced more cheaply and quickly than at present.

Attempts to roast ore in this manner have been frequently made, but just as often discarded as tedious and imperfect. An ore which does not bear the expenses of roasting in a reverberatory furnace should be left alone.

During the past year, experiments have been made at the Germania works, near Salt Lake City, to calcine mattes in an Unterharz kiln, but with what result I am not informed.

(TO BE CONTINUED.)

PUBLIC LAND SALE.—The Commissioner of the General Land-Office has been informed that the Register of the Land-Office of the St. Cloud District, Minnesota, began, August 20th, the sale of 2,000,000 acres of public land at auction. The price realized was $3.35 per acre.

An exchange says: Twenty-one miles of new road are to be constructed on the Seattle & Tacoma, and the work is well under way. From Tacoma to Seattle by this route, the distance is forty-one miles. The Puyallup extension from Tacoma, commonly known as "the coal road," will be used for ten miles, and ten miles of the coal road from Seattle to Black River will also be utilized; so that the total length of new road (from track to track of old roads) will be as above stated. Much trestle-work is required on this line—four or five miles in all—besides bridges across Black, White, Stuck, and Puyallup rivers. The Black River bridge will be a single span of 160 feet; that over White River, a single span of 180 feet; and those over the Stuck and Puyallup, respectively 160 and 320 feet. It is confidently expected that the road will be finished before the first of September.

## THE DIVINING-ROD.*

By Rossiter W. Raymond, Ph.D., New York City.

(*Concluded from page* 81.)

Numerous hydroscopes soon appeared in Italy, and a vigorous discussion of the subject followed. One of the latest celebrated experts of this class was Campetti, who was called to Munich in 1806 for scientific examination. One of the writers of this period, the Abbé Amoretti, himself a member of a family containing many hydroscopes, makes the significant assertion that the sensation experienced by the holder of the divining-rod is one of heat or cold. But the name of Amoretti recalls the fact that he was one of those who revived and continued the discussion of "the magic pendulum."

The earliest mention of this apparatus, according to M. Chevreul, is found in the work of Ammianus Marcellinus, the last of the Latin historians, who died A.D. 390. In an obscure passage (lib. xxix., cap. 1), giving the confession of one of the conspirators against the Emperor of the East, this author describes, in the words of the conspirator, the ceremonies adopted by the band to discover the name of the emperor's predestined successor. Among these was the use of a ring suspended by a fine thread over a disk, around the edge of which, at equal intervals, were the letters of the alphabet. The ring in its oscillations pointed out successively the letters T, H, E, O: whereupon, without further continuing the inquiry, all perceived that Theodorus was the one designated by destiny.

Father Schott mentions the pendulum in his *Physica Curiosa* (1662), already alluded to in this paper.

In the latter part of the eighteenth century, and at the beginning of the nineteenth, several scientific men were attracted to this phenomenon. Albert Fortis (*Mémoires pour servir à l'Histoire naturelle et principalement à l'Oryctographie de l'Italie et des Pays adjacents*, 1802), Prof. Gerboin of Strasburg (*Recherches experimentales sur un nouveau Mode de l'Action électrique*, 1808), and Prof. Ritter, of Munich (see his report in the Tübingen *Morgenblatt für gebildete Stände*, No. 26, January 30th, 1807), were among the number, as well as the Abbé Charles Amoretti, librarian at Milan, to whom I have already alluded. As this mention of the pendulum is in the nature of a digression, although (as will appear) not without pertinence to my main argument, I content myself with an abstract from Ritter's article. He says:

"Take a cube of pyrites, native sulphur or any metal. Size and form are indifferent. We may use, for instance, a gold ring. This body is attached to a piece of thread, a quarter to half an ell long. This is held pinched between two fingers and suspended vertically, all mechanical movement being hindered. It is best to wet the thread slightly. In this condition, the pendulum is held over or close to a vessel full of water, or over any metal, as a piece of money or a plaque of zinc or copper. The pendulum insensibly assumes elliptical oscillations, which form themselves into a circle, becoming more and more regular. On the north pole of the magnet, the movement is from left to right; over the south pole, from right to left; over copper or silver, as in the former instance; over zinc or water, as in the latter. . . . Over an orange or an apple, on the side of the stem, the move is the same as over a south pole; on the opposite side, as over the north pole. The same difference in polarity is shown by the two ends of a fresh egg. It shows itself still more strikingly in the different parts of the human body, the head acting upon the pendulum like zinc; the sole of the foot, like copper; forehead and eyes, north pole; nose and mouth, south pole; chin, like the forehead; and so on, with all parts. The palm and the back of the hand act in opposite senses. The pendulum will move over every point of the finger, and even over the fourth or ring-finger, but, in that case, in an opposite direction. The finger has also the faculty of arresting or diverting the movement of the pendulum. It needs merely to be placed alone upon the table used in the experiment."

So much for the outline of Ritter's statement. He was at this time occupied with Campetti, above mentioned, and naturally he brought together in his thoughts the divining-rod of Campetti with the pendulum of Fortis (Fortis had experimented with it, and it was often called by his name, in consequence; but his death in 1803 deprived Ritter of his advice and aid in further tests).

Campetti was a young peasant from the borders of the *Lago di Garda*, who had seen the performances of Pennet, Dr. Thouvenel's last *protégé*, and had found himself possessed of similar powers. Not only Ritter, but Schelling and Franz Baader examined him. The opinion expressed by Ritter was, that the divining-rod is simply a double pendulum, requiring, to set it in motion, a force greater than those which move the pendulum. Ritter wrote this after consultation with Amoretti and others; and after either he or Amoretti had visited and consulted, at Padua, the great Volta.

But Professor Gerboin carried his scientific study of the pendulum to a much greater extent. His book contains in 356 octavo pages the records of two hundred and fifty-three experiments, and a most elaborate theory of "organo-electric force," in its different qualities, expansive, compressive, passive perturbatory, and active perturbatory. The simplest actions of these qualities may be indicated thus—to condense from the professor's somewhat verbose description:

By virtue of the *expansive* quality, which resides most abundantly in the thumb and fore-finger, a pendulum held between these two is caused to describe with its center of gravity a circle. The *compressive* quality, belonging characteristically to the middle finger, will not permit this motion, or will stop it—as when a highly *compressive* man touches the hand of an *expansive* man, which is holding the swinging pendulum. Contact ceasing, the movement recommences. The *passive perturbatory* is a high degree of the expansive, and the *active perturbatory* is in like manner a powerful *compressive*. The possessor of the former, if, while holding a pendulum he is suitably touched by one of the first or second class, will find the pendulum, if at rest, to start backward; and if in motion already, to reverse its motion. The fourth class is, like the second, negative in its action. Persons exercising either the compressive or the active perturbatory qual-

* Read at the Boston Meeting of the American Institute of Mining Engineers.

ity can not cause the pendulum to oscillate; they can only counteract or reverse its oscillations in the hands of others.

Considering that the author goes on to formulate the permutations and combinations of these qualities of force, their relations to the different fingers, and to a long list of organic and inorganic bodies, I may be excused from following further his intricate and obscure system. Elaborate as it is, the whole structure is absolutely baseless; and constitutes a capital example of what St. Paul denominated "science, falsely so-called." Its vast array of worthless experiments are merely so many ciphers in a row, with a decimal point instead of a unit at the head. When the distinguished chemist Michel Eugène Chevreul (long the chief of the Gobelin tapestry-works, and the author of a well-known book on Color, as well as other important works) took up the subject in 1812, he was not long in discovering that, when the eyes of the operator were blindfolded, so that neither his will nor his thought could consciously or unconsciously affect the movement of the pendulum, the data, arguments, and conclusions of Fortis, Amoretti, Ritter, and Gerboin, the organo-electric force, with its qualities *expansive*, *compressive*, and *perturbatory*; the south poles and north poles, the classification of the universe thereby; in short, the entire science, bag and baggage, disappeared!

Gerboin had pronounced the action of the divining-rod to be a case of *passive perturbatory*. Chevreul, as we shall see, put both the rod and the pendulum in a new category. But before proceeding to state his theory, I will devote a word or two to the evidence presented in our own country.

It is safe to say that most of it, like most of the evidence of the past, is open to the suspicion of at least an alloy of deception. Men who make money out of their reputed skill with the divining-rod and who could not make as much money or advertise themselves so widely if they claimed only a high degree of skill as prospectors, will almost inevitably ascribe to the rod what is due to other means of inquiry; will explain away failures, exaggerate successes, and not establish or execute or permit really thorough and sincere experiment. The most distinguished expert in this art on the Pacific coast has been repeatedly made ridiculous by the result of test experiments. On one occasion, as I learn from an eye-witness, who also reported the circumstances to the *Mining and Scientific Press* of San Francisco, this diviner was permitted to inspect a metallurgical laboratory, which always contained a large amount of gold, either in bullion or coin. After this inspection, he was brought (blindfold) again into the laboratory, and assured that no coin or bullion had been removed. Under these circumstances, he was requested to find the metal with his rod. The coin had all been put in its natural receptacle, the fire-proof safe; and the bullion had been fastened with wire to the under-side of a writing-table. The operator found neither of them, though the point of his rod was frequently within an inch of thousands of dollars. He probably suspected a trick, and he declared that the gold had been removed. When the bandage was again removed from his eyes, and the coin and bullion shown to him, he claimed that his rod had been diverted by the immense amount of treasure in a bank half a block distant! There have also been operators in California claiming to be natural magnets, and not using the rod; but they are not known to have accomplished any better success. One of these natural magnets was employed to trace a lost vein for a mining company at Grass Valley, the mine of which had been at one time the most productive in California. Under his direction, the company cut for many hundred feet, at an expense of from $30 to $40 per foot, through tough serpentine rock, and found nothing. Not only are these belts of serpentine at Grass Valley well known to be barren in general, but this particular belt was actually exposed in a cross-section, parallel to this expensive underground cross-cut, only one eighth of a mile away. The persons most familiar with the mining districts of the West declare that in Grass Valley, and elsewhere, the divining-rod has accomplished nothing of practical value. It is very recently announced by telegraph from Tombstone, Arizona, that a large body of ore has been found at a considerable depth, under a spot indicated by the "hooda-stick" (which, I suppose, is some sort of divining-rod) in the hands of a common workman. I need hardly say that such a discovery proves nothing. It would be of course presumptuous for me, in the absence of information as to persons and circumstances, to criticise this most recent case; but I can not forbear saying that nothing is more common in the experience of mining superintendents than the discovery of ore-bodies by workmen, who have carried for a long time the secret knowledge of their existence. Most frequently it occurs when a mine seems to to have been exhausted, or at least the superintendent does not know where to look for ore, and finally leases some portion of the ground to miners who, by a good luck that would be surprising if it were not so easily explained, go straightway into a bonanza. It is not always, however, the certain knowledge of the existence of an ore-body observed by workmen, and kept secret with a view to future profit, which guides these practical explorers. Often it is their great familiarity with the indications of the ground, and sometimes, let me add, the ignorance and pride of the manager himself co-operate with this result, by leading him to pursue some erroneous theory of exploration, and to refuse the advice of practical men. The so-called instinct of Mexican miners for finding ore, exhibited particularly in such irregular formations as those of the quicksilver mines of New Almaden, is, indeed, an unconscious practice of an unwritten science.

The scientific explanation of the movement of the divining-rod was given by M. Chevreul, in a letter to M. Ampère, published in 1833 in the *Revue des Deux Mondes*. This letter contained an account of the experiments made by the writer in 1812, more than twenty years before, with the pendulum. Finally, in 1853, M. Chevreul having been apointed by the Academy of Sciences upon a committee to examine a work on the divining-rod, wrote a report on the subject, including the "exploring pendulum" and the then novel wonders of "table-tipping."

This report was published in 1854 under the title *De la Baguette divinatoire, du Pendule dit Explorateur, et des Tables tournantes, au Point de Vue de l'Histoire, de la Critique et de la Méthode experimentale.* It is worthy of notice that this venerable *savant* is still active at the age of ninety-seven; only the other day, he spoke before the Academy, referring to a paper he had presented to that body, if I remember correctly, seventy years ago!

Chevreul ascribes the movement of the rod, apart from cases of deliberate deception, to minute, unconscious muscular movements; and these are caused, he thinks, by the imagination or intuitive or unconscious decision or expectation of the operator. An impression that the rod will dip at a certain point, or a wish that it would, or even, in some minds, a fear that it may do so, are all effective causes of the peculiar muscular movement. Stories describing motions of the rod so violent as to strip the bark from it, in spite of the resistance of the holder, do not disprove the above theory. The position of arms, hands, and fingers usually prescribed for the holding of the rod, as explained in the beginning of this essay, is one in which it is not easy (though not impossible) to produce by conscious effort the peculiar movement referred to. But it is also one in which skillful effort, if employed, may be easily disguised; and finally, it is one which invites muscular cramps, and produces muscular torsions and involuntary movements, not to be resisted successfully without a change of position. Under these circumstances, a man might easily twist the bark from a willow stick, and yet fancy he was trying not to do it.

In concluding this survey of the subject, I shall take a somewhat wider view than M. Chevreul, and my remarks, though based on his theory, should not be received as representing it.

From the mass of testimony, good, bad, and indifferent, the following propositions may be safely deduced:

1. The material, consecration, astrological relations, and ritual formalities of the rod are entirely irrelevant and indifferent to its efficacy. This disposes at a stroke of nine tenths of the science which the middle ages so laboriously accumulated on the subject.

2. The rod itself is entirely inert, unless in the hands of a human operator; and according to the declaration of the most famous experts, such as Aymar, Bleton, Amoretti, and many others, and a whole school of diviners who do not use the rod at all, it is merely an index, revealing and magnifying in visible results the peculiar inward sensations of the diviner.

3. The favorite and most convenient form of the rod (λ) is one which promotes involuntary movements and also permits deception.

4. The involuntary minute muscular movements may proceed either from the causes enumerated by Chevreul, or from a truly and purely physical sensation. To this I will presently recur.

5. The uses of the rod for discovering moral qualities, re-locating missing landmarks, tracing stolen property, prophesying the future, or even (as in the seventeenth century was the case) settling the orthodoxy of theological dogmas, will not now be seriously defended by any one. They belong to charlatanry and superstition.

6. The agency of demons we may also set aside, as a view outgrown if not disproved. The pious Jesuit Gaspard Schott (1662) who held this view, was, as we have seen, shaken in his faith, though not convinced, by testimony showing how often the rod failed to act, or gave unreliable indications. He half admits that, if Satan were at the bottom of it, it should work better. As an instrument of divination, it is unworthy of the devil! But, it might have been rejoined, that as a means of perplexing and misleading mankind, that distinguished expert could scarcely have improved upon it.

As old Albinus (*Das entlarvte Idol der Wünschelruthe*, 1700) quaintly says:

"Ich achte, dass kein verworrener Ding in der Welt zu finden, als das Wünschelruthen-Wesen, denn was Einem recht und tauglich ist, das ist vielen Anderen wieder unrecht und untauglich, dass aus solcher grossen confusion nicht viel Gutes zu präsumiren ist."

[I ween, that no confoundeder thing is to be found in the world than the divining-rod business; for whatsoever is right and fit according to one, the same is wrong and unfit according to others; until there is no good to be presumed, out of so great confusion.]

7. The application of the rod to the discovery of metals, coal, buried treasure, etc., is shown abundantly to be chimerical. The rules and methods, as well as the asserted performances, of its professors contradict each other; and innumerable failures and exposures have justly covered with ridicule their pretensions.

8. The transparent humbug of locating wells with the rod, to strike oil at depths of from a hundred to thousands of feet, needs no comment. In this case, there are positively no signs by which a given *spot* can be selected. The experience of neighbors may show a certain area to be probably productive; and within that area a certain line may be inferred, sometimes, to be the line of a productive channel. But if a keen observer, having gone so far, professes to select a point on that line, he is simply betting on his luck; and, as carried on in Pennsylvania, the bet is a safe one for the oil-smeller, who gets a handsome fee if he wins, and loses, in the opposite event, nothing but an hour or two of time.

9. The case is somewhat different with the discovery of springs, and (since ore-deposits always have been and often still are the channels of springs) of ore-deposits. Here we have much stronger and more abundant evidence in favor of the rod; and here, in my judgment, there is a residuum of scientific value, after making all necessary deductions for exaggeration, self-deception, and fraud. Keeping in mind that the rod is merely an index to the minute muscular movement, and that this movement may have a mental or a physical cause, let us consider (putting aside at once all cases of deliberate deception) the following facts:

There is undoubtedly a practical science of discovering mineral deposits and springs. The most skillful prospectors can scarcely explain how they decide upon the place where they dig; and yet, though they are by no means always successful, it is certain that they are more successful than the inexperienced. The books, from Agricola down, give rules and signs; but the practical explorer is unacquainted with the books. He has a science of his own, which affects his mind, without conscious reasoning, by the principles of association and memory. He recognizes in a new locality the tokens that he has become accustomed to associate elsewhere with a rich gulch, or an abundance of pay-quartz. Perhaps he never took conscious note of them; yet their recurrence affects his judgment. This practical skill is almost unerring within narrow limits. Under new conditions, it breaks down. Some of the most absurdly foolish gold-mining enterprises I have known have been set on foot by old California miners, who, returning to their former homes east of the mountains, have said at once of some ravine or hillside, that it was "just the place for gold." In like manner, certain

omens and signs from Cornwall have been carried around the world by Cornish miners. But whatever the errors of practical prospectors, the noteworthy point is, that in localities with which they are familiar (or in other localities where the conditions are the same), they come swiftly, surely, and without conscious reasoning to impressions and decisions. A decision of this kind would probably, in a man of suitable nervous organization, affect the muscles already constrained by holding a divining-rod, and the minute muscular movement or inward sensation might be unconscious.

The case is still plainer with regard to the discovery of springs. Every body knows that Indians in our desert West can find water where most white men can not; and the experienced frontiersman has learned the art from the savages. The conformation of the surface, the track of animals, above all, the presence or absence of certain plants, are his guides. In regions where the finding of water within a few feet of the surface is a question of life or death, it becomes a science very rapidly. The location of artesian wells is a different matter. Science will do that in a general way; but science will not determine a difference between one spot and another, ten or twenty feet away, the geological and topographical conditions being alike in both; and the selection of one of two such points as better than the other for a deep well is purely a piece of imagination or deceit. It must be remembered, however, that the diviner has in such a case an easy task. If possessed of sufficient practical judgment to decide that a certain area or line would probablybe suitable for boring, he is pretty sure to be safe in selecting any point of it. But this, it will be seen, is very different from the unconscious skill which points out in the dry *arroyo* the very spot where water will be found in half an hour's digging.

In abundantly watered regions like New England, it is perfectly well-known that the springs follow, under or through the soil and above the bed-rock, more or less defined channels. A well may be dug at one point without success, and a subsequent attempt a few yards away may be successful. The superficial signs of these water-courses are often subtle, and they are little studied by the inhabitants in general. It is not necessary that a farmer, who will want to locate a well once in his lifetime, should know the signs of water, as a ranchman or *vaquero* must know them. Hence, men who are keen observers (in many instances, finding profit in the business) get impressions, amounting to a local science, of the "lay" of the rocks, the general courses of the springs, the differences in surface vegetation, the earlier or later greenness of grass, the presence of particular grasses and shrubs, the ascent of local vapors at sunrise, the behavior of frosts; in short, a hundred minute tokens which betray the presence, even at considerable depth, of a water-channel, and the point at which it comes nearest to the surface. The unconscious judgment of such an expert may decide upon a given spot over which he walks; and while he could undoubtedly come to this conclusion without having a rod in his hand, I am willing to admit seriously that the rod may help him make up his mind by emphasizing for him his own slightest tendency to a decision. It should be remembered here that even Bleton, the greatest of all the hydroscopists, generally used to go (if permitted) many times over a piece of land before finally locating a well, and often disregarded the first intimation of the rod. In other words, unless he felt sure, every time he crossed a given spot, that it was a good place to dig, he did not rely upon his first sensation or impression. Moreover, neither he nor any other hydroscope has ever accurately divined, except on an occasional lucky guess, either the distance from the surface or the quantity of a subterranean spring. Yet a very large spring, or one very near the surface, appears to have had, usually, a relatively greater influence upon hydroscopes.

This brings me to the final inquiry, whether there may not be, apart from unconscious skill or judgment, a purely physical effect produced by a subterranean spring upon a person walking over it. Electrical theories on this point were only possible in the days when the laws of electricity were little understood. We know now that the earth is a vast conductor, and that the tension of its currents is consequently so low as to be reckoned as the zero of the electricians' scale; hence, that no perceptible electrical current can leave a particular bit of the earth to pass through a human body and return. For this purpose, analogies between rock-contacts or fissure-veins and the voltaic pile are inapplicable.

But the effects of moisture and temperature upon the nerves are often striking; and here, I think, is a matter which writers on the divining-rod have generally overlooked. The distance at which animals will "scent water" is very great. Their faculty is supposed to consist in great sensitiveness to temperature and moisture. The quickness with which some people "catch cold" on the slightest exposure to dampness—particularly of the soles of the feet—is also a familiar phenomenon. Now, it is curious that among the most puzzling of the well-authenticated accounts of the divining-rod are related instances in which women, unacquainted with its use and not expecting it to work in their hands, have found it to dip, without their conscious help, over spots previously or subsequently shown to contain springs.

Here I would recall the remark of Amoretti, that the sensation of the diviner is one of heat or cold. These two are not easily distinguishable when minute and transient. What we call a chill includes both. Is it not probable that a single unconscious chill may be the physical result, to certain sensitive persons, of walking over a spring of water or a belt of rock or soil kept by running water cooler than the adjacent rock or soil, or a spot of surface made by the same cause damper than the surrounding surface? That these causes exist, is beyond doubt. Thermometrical measurements have not been made: but the way in which grass grows and snow lies and frost settles and vapors rise over springs, is due to the temperature and moisture of the ground in such places. Goethe in one of his novels (*Die Wahlverwandtschaften*, I believe), describes a lady as seized with a sudden chill upon a spot where subsequently the outcrop of a coal-bed is discovered. The incident is introduced without attempt at scientific explanation, and apparently to convey to the readers a vivid conception of the lady's extreme delicacy of temperament. I infer from it that such cases were known to the great philosopher, and that he believed such supersensitiveness to be in some way connected with the performances of diviners.

To this, then, the rod of Moses, of Jacob, of Mercury, of Circe, of Valentine, of Beausoleil, of Vallemont, of Aymar, of Bleton, of Pennet, of Campetti—even of Mr. Latimer—has come at last. In itself it is nothing. Its claims to virtues derived from Deity, from Satan, from affinities and sympathies, from corpuscular effluvia, from electrical currents, from passive perturbatory qualities of organo-electric force, are hopelessly collapsed and discarded. A whole library of learned rubbish about it, which remains to us, furnishes jargon for charlatans, marvelous tales for fools, and amusement for antiquarians; otherwise it is only fit to constitute part of Mr. Caxton's *History of Human Error*. And the sphere of the divining-rod has shrunk with its authority. In one department after another, it has been found useless. Even in the one application left to it with any show of reason, it is nothing unless held in skillful hands, and whoever has the skill may dispense with the rod. It belongs with "the magic pendulum" and "Planchette," among the toys of children. Or if it be worthy the attention of scientific students, it is the students of psychology and biology, not of geology and hydroscopy and the science of ore-deposits, who can profitably consider it. For us miners and prospectors, the advice holds good which was given us three hundred years ago by the wise Agricola, the father of our profession, who says the believers in the rod find some veins with it by accident. "*Sed idem multo sæpius perdunt operam, et ut venas invenire possint, nihilominus in fossis agendis defatigantur, quam adversæ partis metallici*"—"but the same people much more frequently lose their pains, and in order to discover veins have to fatigue themselves with digging, not less than the miners of the opposite school."

As a piece of sorcery, he goes on to say, the virtuous and respectable miner will avoid it; as a piece of science, it is inferior to the study of nature, following the indications of which, the skillful and prudent miner selects a good place for exploration, and "*ibi metallicus agit fossas*"—"there the miner digs"—to which business, rod or no rod, he is bound to come at last.

## THE BRITISH ACCIDENT STATISTICS FOR 1882.

We are indebted to Mr. R. J. Frecheville, of Truro, one of her majesty's inspectors, for an early report on the production of the mines of Great Britain and of the accidents which occurred. Turning first to the mines classified under the Coal Mines Regulation Act, we have the following series of figures for the number of persons employed above and below ground, and the quantity of mineral raised, for the period from 1873 to 1882, both inclusive:

PERSONS EMPLOYED AND PRODUCTION OF ENGLISH COAL MINES.

| Year. | Persons Employed. | | Coal. | Total, including coal, fire-clay, iron-stone, shale, etc. |
|---|---|---|---|---|
| | Under ground. | Above ground. | | |
| 1873 | 407,808 | 106,341 | 128,680,131 | 143,041,246 |
| 1874 | 428,611 | 110,218 | 126,590,108 | 140,713,832 |
| 1875 | 427,017 | 108,828 | 133,306,485 | 147,700,313 |
| 1876 | 409,229 | 105,303 | 134,125,166 | 148,989,385 |
| 1877 | 395,025 | 99,366 | 134,179,968 | 148,846,260 |
| 1878 | 382,979 | 92,350 | 132,612,063 | 145,798,138 |
| 1879 | 385,179 | 91,631 | 133,720,393 | 145,366,369 |
| 1880 | 391,381 | 93,552 | 146,969,409 | 161,466,793 |
| 1881 | 399,387 | 96,090 | 154,184,300 | 168,959,931 |
| 1882 | 406,192 | 97,795 | 156,499,977 | 171,334,032 |

The general figures for the total number of accidents and deaths for the same period are given below:

ACCIDENT STATISTICS IN ENGLISH MINES.

| Year. | Separate fatal accidents. | Lives lost by the accidents. | Persons Employed. | | Death-rate from accidents per 1000 persons employed. | Total of Mineral Mined. | | Number of mines. |
|---|---|---|---|---|---|---|---|---|
| | | | Per fatal accident. | Per life lost. | | Per fatal accident. | Per life lost. | |
| 1873 | 973 | 1,069 | 528 | 481 | 2·079 | 146,867 | 133,677 | 3,938 |
| 1874 | 895 | 1,056 | 602 | 510 | 1·959 | 157,222 | 133,251 | 4,332 |
| 1875 | 927 | 1,244 | 578 | 430 | 2·321 | 159,331 | 118,730 | 4,501 |
| 1876 | 839 | 933 | 613 | 551 | 1·813 | 177,580 | 159,688 | 4,385 |
| 1877 | 864 | 1,208 | 572 | 409 | 2·443 | 172,276 | 123,217 | 4,231 |
| 1878 | 811 | 1,413 | 586 | 336 | 2·972 | 179,777 | 103,183 | 3,968 |
| 1879 | 782 | 973 | 610 | 490 | 2·040 | 185,890 | 149,400 | 3,956 |
| 1880 | 815 | 1,318 | 595 | 368 | 2·718 | 198,119 | 122,509 | 3,904 |
| 1881 | 844 | 954 | 587 | 519 | 1·925 | 200,189 | 177,106 | 3,847 |
| 1882 | 876 | 1,126 | 575 | 447 | 2·234 | 195,586 | 152,161 | 3,814 |

These data, it will be seen, are remarkably complete; and it is a source of much regret that as yet it has been impossible to show any thing like it for this country, even for a single year. We can not help believing that, when the Department of Industrial Statistics of the United States Geological Survey has once fully mastered the work it has so auspiciously begun, it will be able to turn its attention to the gathering of accident statistics. We know that the industrious chief of the department, Mr. Albert Williams, Jr., has already contemplated taking up this work, and we trust that it may not be long before he will be able to enter upon it systematically. The figures given above prove again the point upon which we have repeatedly insisted, that single years do not furnish a good criterion for judging of the number of fatal accidents and the deaths. The fluctuations are great, and it is not possible to trace from them any direct evidence of a decrease in the danger of the miner's work

The causes of the accidents and deaths for the past two years are fully

given in the following tables. For details over a series of years, we must refer to the data given in the issue of COAL of August 16th, 1882:

ACCIDENTS AND DEATHS IN ENGLISH COAL MINES.

| | 1882. | | 1881. | |
|---|---|---|---|---|
| | Fatal accidents. | Deaths. | Fatal accidents. | Deaths. |
| Explosions of fire-damp | 35 | 250 | 31 | 116 |
| *Falls in mines:* | | | | |
| Falls of sides | 127 | 129 | 114 | 114 |
| Falls of roofs | 332 | 339 | 325 | 336 |
| Total falls | 459 | 468 | 439 | 450 |
| *In shafts:* | | | | |
| Overwinding | 3 | 3 | 5 | 5 |
| Ropes and chains breaking | 6 | 9 | 2 | 2 |
| Ascending or descending by machinery | 18 | 24 | 26 | 27 |
| Falling into shaft from surface | 6 | 6 | 5 | 5 |
| Things falling from surface | 7 | 8 | 6 | 6 |
| Falling from part way down | 23 | 26 | 30 | 30 |
| Things falling from part way down | 8 | 8 | 5 | 8 |
| Miscellaneous | 30 | 32 | 27 | 27 |
| Total in shafts | 101 | 116 | 106 | 110 |
| *Miscellaneous underground:* | | | | |
| Explosion of gunpowder, etc | 11 | 11 | 17 | 17 |
| Suffocation by gases | 4 | 15 | 6 | 10 |
| Irruptions of water | 1 | 1 | ... | ... |
| On inclined planes | 54 | 55 | 43 | 45 |
| By trams and tubs | 99 | 98 | 83 | 86 |
| By machinery underground | 6 | 6 | 8 | 8 |
| Sundries underground | 22 | 22 | 24 | 24 |
| Total miscellaneous underground | 197 | 208 | 181 | 190 |
| *On surface:* | | | | |
| By machinery | 9 | 9 | 18 | 18 |
| Boiler bursting | 2 | 2 | 1 | 2 |
| Miscellaneous | 73 | 73 | 68 | 68 |
| Total on surface | 84 | 84 | 87 | 88 |
| Gross total | 876 | 1,126 | 844 | 954 |

This shows a heavy increase in the mortality, due chiefly to the great number of lives lost in a few colliery explosions. A brief summary of the corresponding figures for the three preceding decades will aid in showing how the record of the last two years compares with that of the past:

RATIO OF PERSONS EMPLOYED TO EACH TOTAL ACCIDENT.

| YEAR. | Explosions. | Roof and sides falling. | Shaft. | Miscellaneous underground. | Miscellaneous surface. | Total. |
|---|---|---|---|---|---|---|
| 1851-60 | 3,000 | 681 | 1,339 | 2,453 | 5,257 | 318 |
| 1861-70 | 5,650 | 792 | 2,394 | 2,045 | 4,326 | 388 |
| 1871-80 | 11,372 | 1,104 | 3,991 | 2,747 | 5,529 | 559 |
| 1881 | 15,983 | 1,128 | 4,674 | 2,737 | 5,695 | 587 |
| 1882 | 14,399 | 1,098 | 4,989 | 2,558 | 5,999 | 575 |

RATIO OF PERSONS EMPLOYED TO EACH DEATH.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1851-60 | 1,008 | 653 | 1,161 | 2,074 | 4,872 | 215 |
| 1861-70 | 1,408 | 767 | 2,121 | 1,666 | 4,119 | 300 |
| 1871-80 | 1,795 | 1,069 | 3,557 | 2,535 | 5,369 | 425 |
| 1881 | 4,271 | 1,101 | 4,504 | 2,607 | 5,630 | 519 |
| 1882 | 2,015 | 1,076 | 4,344 | 2,423 | 5,990 | 447 |

TOTAL DEATHS.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1851-1882 | 7,760 | 13,356 | 5,205 | 5,402 | 2,350 | 34,073 |

In thirty-two years, 34,073 persons were killed in mining the coal and allied minerals in Great Britain, or at the rate of upward of one thousand people annually, one fifth of the deaths being due to the explosion of fire-damp.—*Coal.*

## FURNACE, MILL, AND FACTORY.

Hendey & Meyer, of Denver, Colo., are running full-time, employing over one hundred hands. They are turning out at present two seven-foot hoisting-drums and two steel boilers of 70 horse-power each, for the Iron Silver Mining Company, Leadville; one double hoisting-engine of 100 horse-power, and an automatic cut-off steam-engine of the same capacity, to go with the hoisting-engine, for the American Smelting Company, Leadville, duplicating a former order. They recently made a 100 horse-power steam-engine for the Colorado Smelting Company, South Pueblo, and are now working on another machine of like capacity for the same company. They are also at work on a 70 horse-power steel boiler and an automatic cut-off engine of 60 horse-power, for a flouring-mill at Durango, Colo.; and have recently erected a 10-inch Cornish pump at the Evening Star mine, Leadville. They put in all the machinery at the Colorado Smelting-Works, South Pueblo, Colo., which expects to blow in before September first. Messrs. Hendey & Meyer erect every machine and give it a running trial before shipping.

The Foreign Exhibition Building at Boston has been recently supplied with a five-inch Curtis pressure regulator, in order to utilize the exhaust steam for heating purposes.

The Ashland Coal and Iron Company's machine-shops at Asbland, Ky., have just made and set up a new hydraulic press, christened Jumbo, weighing 6000 pounds, which will do duty principally in pressing wheels on or off axles, exerting a pressure of thirty tons and more if necessary. This company has contracted with Fairbanks, Morse & Co., for a tank and tower fifty feet high, the tank to hold 50,000 gallons of water, which will be held as a reservoir to draw water for the use of the works, and also as a protection and preventive in case of fire.

The foundry business of Mr. William Hamilton, Peterboro', Canada, is to be carried on by a limited liability company, known as the William Hamilton Manufacturing Company; capital, $200,000. The letters patent have issued to George A. Cox, William Hamilton, George Munro, Andrew Macfarlane, and Richard Hall, all of Peterboro'.

Iron and steel-works are to be erected at once at Gunnison, Colo., a company having been organized for that purpose with a capital of $5,000,000.

John Cover, superintendent of the Clare Furnace, New Castle, Pa., gives the following as the output of that furnace for one week's melting: 33½ cinder, 33⅓ lake ore, 33⅓ native ore.

| | | |
|---|---|---|
| 1st day | 101 | tons. |
| 2d day | 106 | " |
| 3d day | 105 | " |
| 4th day | 107 | " |
| 5th day | 110 | " |
| 6th day | 116 | " |
| 7th day | 110 | " |
| Total | 755 | " |

Size of furnace, 65 feet high; bosh, 16 feet.

The Philadelphia & Reading Coal and Iron Company will now manufacture rails sixty feet long, instead of thirty as before. The weight will also be increased about twenty pounds a yard. This step is taken on account of the increased weight of passenger cars.

The Phœnix Iron Company, at Phœnixville, Pa., has just built and put in operation one of the Taylor-Langdon patent gas ore-roasting furnaces. It is working very satisfactorily, giving a product of from forty to fifty tons per day of well-roasted ore. The Phœnix Iron Company will build several additional furnaces at Phœnixville.

Furnace No. 3 of the Phœnix Iron Company, at Phœnixville, Pa., of which Mr. Charles I. Rader is manager, produced, in the week ended August 16th, 478·26 gross tons of pig-iron on a fuel consumption of one ton and two cwt. per ton of iron. For the preceding week, the production was 442 tons. This furnace is sixty feet high and fourteen feet in diameter at the bosh, and uses a mixture of coke and anthracite for fuel.

An important contract has just been awarded to Messrs. Bellhouse, Dillon & Co., of Montreal, for the supply of the cast-iron water-pipes for the new Quebec Water-Works, The amount involved is between $250,000 and $300,000.

Three mills of the Acadia Powder Company, at Waverley, fifteen miles from Halifax, N. S., were blown to pieces on the 17th, by an explosion which was heard throughout a radius of seven miles. Three employés lost their lives and several others were hurt. The company has eight mills uninjured. The one next to those destroyed contained fifty tons of powder.

The appraisers of the property of the Manchester Iron and Steel Company, of Alleghany, Pa., Messrs. John W. Chalfant and David B. Oliver, have filed their report in Common Pleas No. 1. The assets are placed by the appraisers at $2?9,640.92. The rolling-mill and blast-furnace in Alleghany are estimated to be worth $425,000, subject, however, to a mortgage of $300,000. Henry Staunton, for the assignees, filed a bond in the sum of $579,281.84 with George W. Cass, of New York, and J. M. Schoonmaker, Jesse H. Lippincot, J. N. O'Neill, and William N. O'Neill, of Alleghany County, as sureties.

Messrs. Sebastian Brown and Skipwith Wilmer, as counsel for William Keyser and John T. Mason, R., have filed a bill in the Circuit Court against Thomas H. Paul & Son and W. H. Whyte, trustee, asking for the appointment of a receiver and sale of the Paul Locomotive-Works, Baltimore. Mr. Whyte, as trustee, filed an answer consenting to the appointment of the receiver and to the sale of the works.

The Redstone Coal Company, it is said, will break ground within the next thirty days for a new rolling-mill on the Redstone branch of the Pennsylvania Railroad, either at Smock's station or at Hill's Bridge, one mile above.

The Colorado Coal and Iron Company has closed a contract with the Chicago Burlington & Quincy Railroad for the delivery to the latter of 5000 tons of stee rails.

H. K. Porter & Co., of Pittsburg, Pa., have under way another very small locomotive for hauling steel ingots at rail-mills. The cylinders are five inches in diameter by ten inches stroke, and the entire weight in working order, including water and fuel, is 6000 pounds. It has no cab, as it works inside of the mill; and no tender, as the water and fuel are carried on the foot-board. These locomotives are also used at sugar plantations for hauling cane on portable tracks, and are the smallest built in the United States for regular service.

The Edes, Mixter & Heald Zinc Company, of Plymouth, Mass., has recently opened valuable zinc mines in East Tennessee. The ore from these mines is found to be of very superior quality, being free from lead, arsenic, and other impurities. An analysis of the zinc made by Messrs. Ledoux & Ricketts, of New York, gave the following results: Iron, 0·017 per cent; zinc, 99·983 per cent. The spelter made by this company is soft and ductile and of unusual strength, making it especially desirable for such work as cartridge brass. The mines and furnaces of the company are near Knoxville, Tenn., the sales offices being at Plymouth, Mass.

## GENERAL MINING NEWS.

### ARIZONA.

COCHISE COUNTY.

ATLANTA.—On this claim, the running of the tunnel at the east end continues with satisfactory results. As soon as the point settled upon has been reached, a large station is to be cut out and a main working-shaft sunk. This mode of working is caused by the configuration of Copper Mountain, in which this claim is situated.

CAVE.—The main shaft is now down forty-eight feet, in iron oxides and copper ore. The copper ore encountered consists of red oxide of copper and green carbonates, very similar to those met with in the 300-foot level of the Copper Queen. Another shaft, sunk 12 feet, is in red oxide of iron, and is situated 199 feet north from the natural cave.

HENDRICKS.—Work has been recommenced. The mine is the westerly extension of the Atlanta, and through both claims a ledge of lead carbonates is known to run, assaying in several instances from $60 to $95 per ton. Recently, some of the lead carbonate ore, carrying silver, from this mine, was reduced with the ore from the Tombstone camp.

TOMBSTONE DISTRICT.

The outlook presented by a visit to many of the properties which are at work, says the *Epitaph*, is encouraging in the extreme, and while there is nothing of startling importance to note, the steady work of the camp proceeds.

GILA COUNTY.

STONEWALL.—The mill is running night and day on tailings, with good results. The circulation of air in the drift on the 280-foot level is good.

GRAHAM COUNTY.

GREAT WESTERN CONSOLIDATED.—Three ingots of refined copper, aggregating fifty pounds, besides a small quantity of gold and silver, have been received in this city from Mr. L. B. Darling, of Providence, R. I. They are the result of a working test of 100 pounds of ore from the property of this company.

YAVAPAI COUNTY.

UNITED VERDE COPPER COMPANY.—Our notice of this enterprise last week was, without any intentional injustice, quite in error. We are now able to state from authority that the smelter was blown in at noon of August 1st, and up to noon of the 11th inst., or in ten days' uninterrupted run, the output of copper bullion was over seventy tons, or fully seven tons daily. The last weekly account was made up to August 11th, at which time shipments had been made of about thirty tons of copper, and teams were arriving to haul the remainder to Ash Fork on the Atlantic & Pacific road. The roads were not impassable, there has been no suspension, nor was there any deficiency of coke. The mountain road, built at great expense by this company, is said to be a remarka-

bly good piece of engineering. It is simple justice to the energetic superintendent, Mr. F. F. Thomas, to say that by his tireless efforts all the labor of opening the Verde property, erecting the furnace, building over ten miles of mountain road, introducing water in nearly a mile of pipe, etc., was accomplished in one hundred and four days from the day of his arrival (April 18th) on the property. The ores are carbonate and oxide, with enough iron to smelt them; and the slags run under one per cent from ores averaging over twenty per cent. The copper bullion is high grade, and portions of the ores carry a *ley* of the precious metals. The reserves of ore are said to be large and constantly increasing with the work of development.

## CALIFORNIA.

### MONO COUNTY—BODIE DISTRICT.

The Bodie *Free Press* gives the bullion shipments of the four operating companies of the district for the first half of 1883 as follows:

| | Gold. | Silver. | Total. |
|---|---|---|---|
| Standard | $564,086 | $79,107 | $643,193 |
| Bodie Consolidated | 59,289 | 89,992 | 149,281 |
| Syndicate | 35,806 | 2,622 | 38,428 |
| Bodie Tunnel | ..... | ..... | 52,742 |
| Total | | | $883,644 |

The Bodie Tunnel Company made only two shipments during June, the mill closing down before the end of the month. The shipments of the Standard mine during July amounted to $95,208.24. In the Syndicate statement, the shipment for July is included.

KENTUCK.—This Sweetwater property is turning out rich ore, and there is a great deal in sight. It is estimated that the bullion output will average at least $20,000 per month.

VIRGINIA CREEK HYDRAULIC COMPANY.—It is thought that the company has struck the old Mono channel, which proved so rich, having encountered a gravel bed running diagonally across the channel first started on.

### PLACER COUNTY.

BLUE RIDGE.—This gold and silver mining claim with its extensions has been located. The ore is reported to run from $15 to $60 per ton; two shafts, one 17 and another 34 feet deep, have been sunk; also a tunnel run 193 feet to cross-cut the vein. The width of the vein is from 16 to 25 feet. It is about fourteen miles from Auburn. Wood and water are in abundance.

## CANADA.

### PROVINCE OF NEW BRUNSWICK.

A quantity of ore from the mines at Mineral Vale was recently shipped to Portland and Boston for treatment. This special shipment is made on account of newly discovered veins thought to be much richer than previous workings. It is expected that large quantities of this ore will be shipped to this country and England.

### NOVA SCOTIA.

HALL-ANDERSON.—The work in mining and milling continues as heretofore.

OXFORD.—The superintendent reports every thing about the mine and mill in good condition. The late scarcity of miners, owing to the fishing season, seems now to be over, and he will now be able to open up all the different leads thoroughly. The ore in the mill lead continues of the same high grade. The face of the east bluff is now 25 feet high and shows enough ore for three months' work. He is sinking on the lake lead, and will let a contract for sinking the main shaft on mill lead as soon as he can get the tenders made. The mill is pronounced by mining visitors the finest in that country, or possibly in any country. The assay of tailings at the mine made from time show hardly more than a trace. A lot sent to this city this week, to be tested here, gave only 88 cents per ton. This, from ore (though perfectly "free") is, to say the least, not a little remarkable when it is milling over $60 per ton.

RENFREW CONSOLIDATED.—At this mine, a sinking of 100 feet through barren rock has rewarded the management with a splendid strike, the ore looking fine and showing three feet in width.

## COLORADO.

### BOULDER COUNTY.

CELESTIAL.—A rumor states that this mine has been sold to English capitalists for $35,000.

### CLEAR CREEK COUNTY.

PAY ROCK.—The mill is treating about 1000 tons of ore per month.

### EAGLE COUNTY.

Considerable work is reported in the gulches tributary to Half Moon Gulch, in the southwestern corner of the county. Particularly is this true in Little and South Half Moon gulches. In the latter gulch are located the well-known Iron Duke and other mines. The Iron Duke is working under lease, and is shipping ore with considerable regularity. The ore is brought in on jacks; but as the ore ranges in value from one to two hundred dollars a ton, it readily bears this expensive method of transportation, and still leaves a fair profit.

GRAPHIC.—Included among the Little Half Moon properties is the group of claims controlled by this company, on which operations are to be resumed.

### GILPIN COUNTY.

DELAWARE.—The lessees are drifting and backstoping at a depth of 300 feet. The ore contains considerable galena and nets from $6 to $50 per ton. The third quality is piling up, and will be sent to the concentration-works. The main shaft is 430 feet deep, but, owing to heavy flow of water, can not be worked to advantage below the 300-foot station.

EGYPTIAN.—Connection from the 400-foot west level with the 500-foot west level has been made through a winze. The body of ore at this point is continuous and of a fair average width. This affords the company quite an extensive body of stoping ground. The 700-foot east and west levels are showing up well, especially the west level, which is driven through a wide vein, the smelting ore being fully eighteen inches wide.

KING.—Development-work is confined to the sinking of the main shaft, now over 300 feet deep.

### GUNNISON COUNTY.

A sale on a group of properties in the Elk Mountains is pending, which, if consummated, will cause $250,000 to change hands.

SYLVANITE.—Reports state that work will shortly be resumed. This property was discovered in the spring of 1879, and is noted for both the quality and quantity of ore it has already produced. But, like most other valuable properties, this has become involved in litigation and has been shut down for more than twelve months.

### LAKE COUNTY.

The prospects are, that the California Gulch extension of the Rio Grande Railroad will not stop at Oro City, but make a turn at that point and run across portions of Breece and Iron hills, tapping all the leading mines on the latter hill.

The *Herald* states that a great deal of activity is at present displayed among the mining properties of Little Ellen Hill. Mere prospects, that have been permitted to lie idle for years past, are working again, and a number of claims have lately been added to the list of productive mines of the Leadville District. The ore secured from the Little Ellen Hill mines, in most instances, is only of medium grade; but as it usually occurs in large bodies, the expense of extraction reaches only a minimum of the average expense per ton of the mines of the district. In consequence, the profits are nearly if not quite as satisfactory as those resulting from the working of mines on Carbonate or Iron Hill. The ore generally is more siliceous than that of the mines in other portions of Lake County, and the expense of smelting a trifle heavier, but in return the mineral all contains an appreciable amount of gold.

ADLAIDE.—In pushing work on the ore-body recently opened in the vicinity of the Ward shaft, on the 160-foot level, the workmen ran into a streak of about fourteen inches of horn-silver. A test of a fair average piece of the ore made twenty two and a half ounces of gold. Ores carrying chloride of silver in minute particles are frequently encountered in nearly all the mines of Iron Hill; but we believe this to be the first instance on record where large pieces of horn-silver ore were discovered in an Iron Hill mine.

AMERICAN SMELTER.—The new 110 horse-power engine, recently purchased, was set in motion recently. Another engine has been ordered, to take the place of the engine recently wrecked. Three of the large furnaces are in blast, and the fourth furnace, it is expected, will be started up. About twelve thousand tons of ore are on the company's premises.

ARKANSAS VALLEY WORKS.—These smelting-works have lately been provided with a new 125 horse-power Corliss engine. Five large furnaces are in blast at the works, and ore is reduced at the rate of about five thousand tons a month.

BREECE.—This iron mine is at work again, having recently received several large contracts for iron ore.

CHRYSOLITE.—Mr. Cuno, who is working a portion of the Chrysolite mine on a lease, is shipping from seventy to eighty tons of ore a day to Leadville smelters.

DUNKIN.—During the past five months, over one thousand feet of prospect-drifts were driven. The working expenses of the mine for July were about $1800, and the net earnings above all expenses $4500. No portion of the mine is now worked on the lease or tribute system. The company has now $22,000 in its treasury, exclusive of the earnings of this month.

IRON SILVER *vs.* A. W. GILL.—A suit has been instituted by the Iron Silver Mining Company against A. W. Gill and others, to recover $50,000, the alleged value of the ore extracted by the Smuggler lessees from the Iron Silver territory.

IRON SILVER.—The company is still engaged in making surface improvements, made necessary by the extension of its underground workings. At the Stone mine, a large new Worthington compound pump is being placed in position, having a capacity of 225 gallons a minute. A similar, but of smaller dimensions, is in use at the Moyer shaft, as well as two sinking-pumps. Two new winding-drums are also added to the plant at the Moyer shaft, and other improvements are in progress. On the Stone mine, where a number of hoisting and pumping-engines are employed, it has been decided to put in several large new boilers. The ground on this claim, owing to large stoping, has been sinking, and the old boilers are out of plumb. As new boilers will be required shortly, it was decided to put in a new battery, and place it in a secure position. The new boilers will possess at least one hundred and fifty horse-power, and are calculated to supply all the engines on the Stone mine with steam.

LITTLE ELLEN.—The concentrating mill attached to this mine, on Little Ellen Hill, belonging to the American Mining and Smelting Company, was burned August 16th. The mill cost about $100,000 originally, and was complete. It did not prove a success, and most of the machinery had been removed before the fire. It was insured for $20,000, and the insurance will probably cover the loss.

LITTLE PITTSBURG.—A lot of waste material placed in front of the Little Pittsburg office some four years ago, to fill a depression in the hillside and make a passable road, has been taken up within the past week, and replaced by surface soil. The material contained, according to the *Herald*, about thirty ounces in silver to the ton, and was shipped to the smelters. The work was done by tribute workers.

MOYAMENSING.—This lode, on Yankee Hill, has encountered a streak of ore, running high in silver. The material is a siliceous iron, carrying the silver in the form of chlorides.

WILLIAM WALLACE.—In the drift run at a depth of 528 feet, a twelve-inch streak of ore has been encountered, which shows a gray sand, slightly mixed with talc. The returns show from sixty-five to eighty-two ounces in silver to the ton, and from forty to sixty per cent of lead. The mineral bears a greater resemblance to the high-grade lead ores of the Carbonate mine than to the ores of the Big Chief and Clontarf. The owners have expended a large sum of money in prospecting this property for the last three or four years. The above is the first ore that has been found.

### PARK COUNTY.

EVERLASTING.—This comparatively new property, situated on Mount Bross, is opening out into quite a bonanza. The mine shows a three-foot contact-vein of ore, from which fifteen tons have been shipped, averaging $209 to the ton.

KANSAS.—Work has been started again.

SOVEREIGN.—Regular ore-shipments are made to the Pioneer stamp-mill. The product of the mines is free-milling gold rock. Air-compressors, machine drills, and other approved appliances are used to facilitate work.

### PITKIN COUNTY.

The parties who recently purchased the Aspen smelter have opened a bank in that town, and made other preparations for business. The smelter is enlarging, and the purchase of ores is in progress.

### SAN JUAN COUNTY.

MINERAL CREEK CONCENTRATING COMPANY.—The superintendent writes that arrangements have been completed for the erection of a thirty-ton concentrating plant at the town of Chattanooga, Red Mountain Mining District. Contracts have been let and work will be prosecuted without delay, it being the intention to push the work so as to have the mill in running order by the first week in October.

PULASKI & WATERFALL.—Reports state that New York parties have purchased these mines, in Bridal Vein Basin, for $65,000. Several adjoining properties have been bonded by these same parties.

### SUMMIT COUNTY.

Concentrating devices are being put in a number of the mines and metallurgical works of this county. The Keystone Bullion Company is putting in six Metcalf concentrators. A new concentrator of forty tons capacity a day is erecting at Governor, and rigs are at work at the Lincoln. The Elyria smelting-works have been leased by Messrs. Newcomb & Musgrove, who are engaged in placing concentrating machinery in the building. The mill is to be used in treating Gibson Hill ore, and also in doing general custom-work.

DONCASTER CONCENTRATING-WORKS.—It is stated that Leadville parties contemplate the purchase of these concentrating-works at Kokomo, and enlarging the establishment to fifty a day capacity.

PAYMASTER.—This property consists of the Paymaster, Silver Ball, and Seven Thirty lodes, or 4500 feet on a large vein of argentiferous galena, 6 feet in width. They are only down 75 feet, but produce from 30 to 50 tons of ore per day. Assays run from 10 to 160 ounces per ton. The plant erected to work the mines and ore consists of a concentrating-mill, in which is a 50 horse-power engine and boiler, Blake crusher, Cornish rolls, Hartz jigs, and Rittinger tables, designed to treat 40 tons of ore per day.

ROBINSON CONSOLIDATED.—The president, it is reported, has stated to the New York *Evening Stock Report*, on his return to the city that the mine never looked better since he was connected with it. Mr. Greer owes to the company a small amount of royalty, which is secured to the company. The company only owes $3100, and has on hand $17,000 cash assets. The reports about the company's having $10,000 debt and about being responsible for any claims besides the above $3100 are not true.

## DAKOTA.

CALEDONIA.—The superintendent reports for the week ended August 12th: Ore produced—from 300-foot level, 896 tons; 400-foot level, 154 tons. The 460-foot level header advanced five feet, making a total of twenty-five feet. There is no change to report in the appearance of the mine. The mill is running to its full capacity.

FATHER DE SMET.—The report for the week ended August 7th shows: Ore extracted from first level, 750 tons; second level, 750 tons; third level, 525 tons. Ore milled, 2025 tons. Golden Gate cross-cut, third level, advanced six feet; total, twenty-five feet. Work stopped. Golden Gate south header advanced seven feet.

## GEORGIA.

The scarcity of water continues, and the consequence is, that but little work is done at the various mines in Lumpkin County.

## IDAHO.

FISH CREEK COPPER MINES.—Arrangements are making to have a copper matting furnace constructed on Little Wood River, to operate upon the rich silver and copper ores of that section. The furnace is of the Rankin & Brayton make, and will run 20 tons of copper matte daily, of an average value of $160 per ton. The plant is expected to be in operation soon, and money will be on hand to purchase ores.

MAYFLOWER.—The vein is reported to be sixty feet wide at the end of the lower tunnel, 900 feet in from the mouth. Burleigh drills will be used to chamber out the ore and expedite the development of the mine. The Mayflower mine has twice the actual amount of pay-ore now in sight that was shown up at the time the mine was purchased, the price being $375,000.

PHILADELPHIA SMELTING COMPANY.—Work has begun on the Silver Star mine, the property of this company. The ore-body is strong, regular, and high-grade. The chances are very favorable for early shipments of ore from the mine to the smelter.

SILVER FORTUNE.—The mine has been bonded for $30,000. A shaft sunk 30 feet on the vein struck water, but exposed a solid body of high-grade galena ore, three feet wide. The bondholders are now developing it.

## MAINE.

It is reported that the West Luber silver mines, in Washington County, are to be worked again, and that a new mill is to be erected.

MOUNT MICA.—Operations have been resumed on this property.

STEWART.—Developments at this copper mine are progressing favorably. Two drifts and a cross-cut are in progress from the bottom of No. 3 shaft, and an open cut at another point on the property is extending. All the openings are showing well.

## MICHIGAN.

A new company, composed of prominent men in Marquette and Houghton counties, will be organized in Ishpeming shortly, to prosecute work on a quartz belt in the vicinity of the Ropes mine, which has been proved to carry well in gold and silver.

CALUMET & HECLA.—The old board of directors have been re-elected. Mr. Agassiz was re-elected president, and C. W. Seabury secretary and treasurer. The financial statement given out for publication shows that the surplus April 30th, 1883, was $1,980,824.53, dividends to the amount of $2,000,000 ($20 per share) having been paid during the year. The above surplus is about $1,400,000 less than on April 30th, 1882, the reduction having been caused in part by the drop in copper and by the expenditure of $1,250,000 for land.

CLEVELAND IRON MINING COMPANY.—At the meeting of stockholders, to be held in Cleveland, September 5th, a resolution will be offered authorizing the board of directors to sell and convey all the lands and real estate of the company in the city of Marquette, Marquette County, together with all its rights, privileges, and reservations in streets and other property appurtenant thereto, and all buildings, improvements, docks, tracks, water and riparian rights owned by it or in which it has any interest.

DETROIT.—Sinking is in active progress in the new shaft, which will, when completed, be the main hoisting-shaft. It is now down 108 feet in blue slate, somewhat mixed with jasper, and will be sunk 14 feet more, when drifting will be commenced eastward toward the present workings. The mine is now getting out about 120 tons of ore per day and is steadily shipping to Detroit by way of the Detroit, Mackinac & Marquette Railrord. Some exploring has been going on in the south part of this property, below the bluff of diorite; but this has been abandoned for the time being.

ROPES.—The stamp-mill was put in operation August 14th. The entire plant worked without a hitch of any kind. The Ishpeming *Agitator* says: Of course, nothing has as yet been learned of the milling qualities of the rock, nor will it be given out until a run of several weeks has been made.

## MONTANA.

The Queen of the Hills and the Homestake mines, in Montana District, have been bonded for six months to I. G. Baker, of Fort Benton, for $60,000. Mr. Baker will organize a company to develop the mines and reduce their ores. These leads are already well developed.

### LEWIS & CLARKE COUNTY.

The mining industry in the vicinity of Helena is having, according to the *Independent*, its boom, though not yet in any extravagant manner. The effect of the liberal policy inaugurated by the railroad magnates has been to stimulate development to such an extent as to render many properties—heretofore idle and considered of little value—quite promising, and the well-known paying mines are adding to their facilities, in some cases very extensively.

BOSTON & MONTANA.—A contract has been made with the Union Iron-Works to put in 24 pans and 12 settlers, besides 48 settling-tanks, at the sixty-stamp mill of the Gloster mine. Another boiler will be added, making four that will be used to furnish power, and a 200 horse-power engine will be added to the present plant, to run the new machinery, which will make an aggregate of 300 horse-power in the mill when completed. A new building, 60 by 190 feet, to accommodate this machinery, will be erected immediately, and the whole will be in working order within ninety days. At the Gloster, another contract will be let to sink the shaft 100 feet deeper for the fourth level, and at the same time start two winzes, one on each side of the shaft, and about 75 feet distant, so as to be able at once to run connecting levels and have plenty of ventilation as well as new ground opened for stoping.

GREGORY CONSOLIDATED.—The old concentrator is to be torn down and a new one erected having a capacity of 75 tons per day. It will be equipped with two of the largest crushers and four of the largest rolls made, and will have two compartments. The Ætna Iron Foundry, of San Francisco, has contracted to complete the concentrator and have it in running order within three months from date. At the mine, for a distance of 400 feet along the sixth, which is the lowest level, the galena is continuous, the ore-product very regular in value, and nearly all that is taken out carries sufficient silver to pay.

## NEVADA.

The total amount of ore extracted in Eureka County for the three months ended June 30th amounted to 18,990 tons, according to the returns made by Assessor Wallace.

BAY STATE.—Ore has been shipped to the Eureka Consolidated furnaces. The mine is looking well. About eight tons per day are now shipped that work from $52 to $70 per ton. In addition to this, about 35 tons are shipped per month that will average $200 per ton.

ONONDAGA.—About 80 tons a week are shipped to Salt Lake. The bottom of the shaft, 110 feet from the surface, shows a body of ore five feet wide that assays high.

RUBY HILL.—The tunnel is in nearly 400 feet. The face is in very favorable-looking broken limestone. Prospecting will be carried on in this mine until ore is struck.

SILVER CONNOR.—A shipment of low-grade ore was recently made that assayed nearly $60 a ton.

### COMSTOCK LODE.

The Cornish pump at the Combination shaft is fast lowering the water, which was up over the 2600 level, pending repairs to the broken rod and bobpin. During the absence of Superintendent Patton, nothing has been done at the face of the north drift of the 3000 level in the Union. Two thirds of the face are still in ore. Sinking the joint winze is making good progress.

GOULD & CURRY.—Good headway is making in the new east drift on the 2500 level. It starts from the southwest drift, which was run out to the Savage line, at a point about 200 feet south of the shaft, and is now out about 100 feet. The face is in dry vein porphyry. There is, indeed, no water in any of the drifts on the 2500 level of the Gould & Curry; but north, in the Best & Belcher, the ground is very wet. The water in the Curry appears to lie out near the west wall. The new east drift will really have the effect of a cross-cut. Its course is east, 20 degrees south.

HALE & NORCROSS.—Pending repairs of the Cornish pump at the Chollar-Norcross-Savage shaft, the water rose above the 2000 level; but the pump is going on now as usual. The temperature on the 2600 level is now but 98 degrees, and it will doubtless go still lower when the water has been lowered to the old mark in the shaft.

UNION CONSOLIDATED.—No work has been done in the face of the north drift on the 3000 level recently. Meantime, the main west cross-drift has been timbered up at the point from which starts the north drift, and work has been pushed as usual in the joint Sierra Nevada winze below the 3000 level. As it now stands, about two thirds of the face of the north drift are in ore. As soon as the superintendent returns, work will doubtless be resumed in the face, and the drift pushed on the north to the Sierra Nevada line.

## NEW MEXICO.

BILLINGS SMELTER.—The smelting-works, situated at Socorro, are now almost completed and will blow in shortly. There are more than a thousand tons of ore in the bins. There will be two furnaces, each with sixty tons capacity.

KINGSTON CONCENTRATION-WORKS.—The capacity of the works is small as yet, the present plant of machinery being erected as an experiment to demonstrate the feasibility of concentrating the low-grade ores of the vicinity of Kingston. The result of a run made upon bullion ore, average value $30 per ton, is given as follows: concentrates, as nine to one; value, $243, showing a loss of only ten per cent. The ore in this instance was difficult to treat.

NEW MEXICO & ILLINOIS.—The Eureka smelter, the property of this company, has closed down after a successful run of over a week. It was the first trial of the machinery, and it gives complete satisfaction. There is scarcity of iron ore for fluxing, and as soon as a supply is obtained, the smelter will start up and run permanently. It is expected that the other smelter will start up shortly. Iron ore of good quality and quantity has been found, and it is thought no further delays will be occasioned by the lack of that article for fluxing. The coke is supplied from Trinidad, and is taken in wagons from Bernalillo to Copper City at a great expense.

## UTAH.

### BOX ELDER COUNTY.

LAST CHANCE.—The Salt Lake *Tribune* says that when Mr. Cullins left this mine, years ago, it had about a foot and a half of ore, upon which they had run 65 feet, which was 20 per cent lead, 30 per cent sulphur, and carried 50 ounces in silver and a little gold. The sulphur was easily burned out by spreading the ores on cord-wood and setting fire to it. Afterward, there were quarreling and mismanagement and waste, and, of course, in time, complete abandonment. At present, Messrs. Bambergers have it. They are running a long, deep tunnel. It will, it is supposed, also furnish a live stream of water to reinforce the limited supply in Can Fork.

SILVER MOUNTAIN.—Good progress is made. About eighty tons of ore are on the dump, which averages about seventy-five ounces silver and forty-five per cent lead. A road is building to the mine, which will soon be completed, and then ore will be sent to the smelters.

### PIUTE COUNTY.

BULLION CAÑON.—This company's ten-stamp mill at Marysvale was recently started on a test run of second-class Pluto ore. The assay of this ore gave about 34 ounces silver per ton, and was found easy to work. The capacity of the mill is from twenty-four to thirty tons per day. After making the tests, the mill was shut down for the purpose of putting in a Frue vanner. It will be started again as soon as this has been done. The property is now in the hands of the same men owning and managing the Pluto property. The first bar of bullion, weighing 515 ounces, was shipped to Salt Lake City. An assay showed it to be 927 fine in silver, and 18 fine in gold, the value of the bar being over $700.

### SEVIER COUNTY.

The discovery of a ledge of copper ore is reported. A tunnel of about 35 feet has been run in to cross-cut it. The ore seems to consist of ruby, black, and red oxides, and ranges in assays from 15 to 45 per cent copper, with a perceptible amount of gold. A new district has been formed and is to be known as the Henry District, and the mine is located as the D. A. Giles copper mine. As usual, this deposit is stated to be an "immense and wonderful body of copper ore," and the immediate attention of capitalists is asked by the local papers.

### SUMMIT COUNTY.

CRESCENT.—Shipments are regularly made. The ore is sampled at Mackintosh's Mill. About 1200 tons of ore are piled on the floor and in the bins, and the place is crowded with daily receipts.

### WASHINGTON COUNTY.

This county is fortunate enough to have within its limits ore which runs as high as $130 in silver—so it is stated. A shaft 87 feet at an angle of 60 degrees has been sunk in this. At this depth the vein has pinched out to a mere line. A drift 20 feet deep has been run horizontally into the hanging-rock. This ends in the vicinity of a cave, exhibiting a high grade of carbonate ore.

### SILVER REEF.

STORMONT.—The official report of August 13th is as follows: Our best stope now is in 23 winze ground, and the following are assays from a point about halfway between the 4th and 5th levels, where the stope is going down a moderate dip underhanded, and all solid ground below except as cut by the 5th level: 14 inches, $13.76 per ton; 14 inches, $35.14 per ton; 12 inches, $157.69 per ton; 12 inches, $7.17 per ton; 6 inches, $73.16 per ton; 18 inches, $36.08 per ton. A splendid stope of ore, and will go down, I hope, a good distance yet.

## WYOMING.

### SILVER CROWN DISTRICT.

COPPER KING.—At this mine, the principal one in the district, two shifts a day are at work, and a depth of sixty-five feet has been attained. They will soon begin two drifts, to test the width of the vein. New machinery will shortly be on hand, to facilitate the hoisting of ore. While the ore is varied in appearance and value, it all shows native copper in considerable quantities.

## FINANCIAL.

### Gold and Silver Stocks.

NEW YORK, Friday Evening, Aug. 24.

The mining market this week has been principally confined to four stocks, namely, Robinson, Sonora, Barcelona, and Alta-Montana. Robinson has suffered a sharp decline and closed weak to-day. Sonora has about held its own and has been steady. Barcelona sold a little weak to-day, and Alta-Montana has been steady throughout. Outside of these stocks, the dealings have been limited, and prices, generally, steady. A full summary of the market is given below. The total number of sales aggregates 142,010 shares, as against 137,900 last week.

The Comstock shares have been quiet and steady. California sold from 35@40c. with a small business. Consolidated Virginia was quiet and strong, selling from 57@66c. Sierra Nevada had a small business at irregular prices; it sold from $4@$4.20@$4.10. Mexican was quiet and steady at $3.35@$3.75. Ophir sold at $3. Consolidated Imperial records a small sale at 5c. Gould & Curry sold at $2.85. Savage sold, assessment unpaid, at $1.80. Best & Belcher, with one small transaction, sold at $3.90. Sutro Tunnel was moderately dealt in and was irregular; it sold at 19@21@20c.

The Leadville stocks were also quiet and steady. Amie sold at 15@14c., with moderate transactions. Chrysolite was quiet and a little weak, selling from $1.10@$1. Dunkin sold at 23c., with a small business. Breece developed a little strength, selling from 18@23c., with a business of 2600 shares. Iron Silver had a small business at strong prices; it sold at $3@$3.20. Little Chief was quiet and strong, selling from 35@45c. Little Pittsburg records a small business at weak prices; it sold from 70@60c. Climax was quiet and steady at 9@10c.

The Bodie stocks were very quiet and were steady. Bodie Consolidated was quiet and weak at 25c. Standard had a small business at steady prices, selling from $5.50@$6. Bulwer records a transaction of 100 shares at 70c.

The Tuscarora stocks were almost neglected and were weak. Argenta sold at 20c. Navajo was quiet and weak at $2.90. Elko Consolidated records small transactions at weak prices, selling from 15 10c.

In the miscellaneous list, Alice has been quiet and weak, selling from $2.40@$2. Bassick sold from $9.75@$9.50, with small transactions. Hall-Anderson was moderately dealt in at steady prices; it sold from $1@$1.05. Homestake was quiet and steady at $17.75@$17.63. Horn-Silver had a fair business at strong prices, selling from $6.25@$6.75. Northern Belle was quiet and steady, selling from $6.75@$6.50. Robinson has been very active and very weak; it sold from 64@49@51c., the business aggregating 39,700 shares. Sierra Grande was quiet and steady, selling from $1.15@$1.05. Stormont records a transaction of 500 shares at 20c.

Alta-Montana has been very active at steady prices, selling from 6@5c. Barcelona records a large business and was weak, selling from 39@34c. Caledonia sold at 62c. Central Arizona was moderately dealt in at steady prices, selling from 15@20c. Decatur records a very small business at 2c. Eastern Oregon has been fairly dealt in and has been strong; it sold from 92@98@96c. Rappahannock sold at 6c., and Red Elephant at 6c. The business in both stocks was small. Sonora Consolidated has been actively dealt in at steady prices; it sold from 24@26c.

The Tip Top Silver Mining Company, of Arizona, has levied an assessment of twenty-five cents a share, delinquent September 24th.

#### MEETINGS.

Baldwin Mining and Milling Company, No. 115 Worth street, New York City. Annual meeting of stockholders and election of trustees, September 11th, between three and four o'clock P.M.

Esmeralda Mining Company, No. 35 Broadway, Room 69, New York City. Annual meeting of stockholders and election of trustees, September 1st, from twelve M. until one o'clock P.M.

#### DIVIDENDS.

The Oxford Mining Company, of Nova Scotia, announces its regular monthly dividend (No. 6) of five per cent, payable August 25th.

The Smuggler Consolidated Mining Company, of Colorado, has declared a dividend of twenty-five cents per share, or $15,000.

#### PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report as follows for the week:

Friday of last week witnessed an upward movement in petroleum to $1.11⅝, though the news from the wells was bearish, and it appeared to be due principally to manipulation. The fluctuations through the week have not been very great, $1.11⅝ being the highest, and $1.07½ the lowest.

Porcupine well No. 9 has been a large producer, and being on the outer northern edge of Balltown, it is regarded as important in showing the possibilities of a farther extension of the fertile territory to the northeast, in which direction several important test-wells are now drilling. The result of this development-work ought to exercise an important influence on the future course of prices; but it will probably be two or three weeks before any thing conclusive will be known about these new undertakings.

One of the surprises of the week was the sharp advance in refined oil to 8c. on last Saturday, and an equally sharp decline Monday morning to 7⅝c. The Standard Oil Company has the control of the prices of refined oil. Rumors have been in circulation for some days about a consolidation of the Standard and tidewater companies, but the report is denied.

No great fluctuations are likely to occur during the coming week, and those who buy on a break of two or three cents, or sell on a sudden spurt, will have the best prospect for a profitable return.

The following dispatch from Titusville, Pa., has been received: The United Pipe Line Company has issued a circular to the oil exchanges of the country, proposing that they appoint gaugers to accompany the United Pipe Line gaugers on their annual inspection, in order to verify the figures given to the oil trade by the company, and to inspect its books. The net stocks held by the United Pipe Lines, according to the statement made on August 10th, were 33,995,765 barrels. The gauging of all oil-tanks will be accomplished on September 1st, and the oil exchanges will appoint ninety-one gaugers, sixteen inspectors, and a number of clerks to accompany the United Pipe Line officials. The gauge given to the trade to-day of the production of Forest County shows that the Cooper tract, with 103 wells, is yielding 3290 barrels, and Balltown, with thirty-six wells, 4790 barrels. Porcupine No. 9 is now flowing at the rate of twenty barrels an hour.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

| | Opening. | Highest. | Lowest. | Closing. | Sales. |
|---|---|---|---|---|---|
| Aug. 18 | $1.10⅝ | $1.11 | $1.09⅝ | $1.10 | 2,056,000 |
| 20 | 1.09¾ | 1.10⅜ | 1.09½ | 1.09¾ | 1,300,000 |
| 21 | 1.09¾ | 1.10 | 1.07¾ | 1.08⅛ | 2,743,000 |
| 22 | 1.07⅞ | 1.09¼ | 1.07½ | 1.09 | 2,460,000 |
| 23 | 1.09⅜ | 1.09⅜ | 1.08⅜ | 1.08¼ | 1,869,000 |
| 24 | 1.08½ | 1.08⅝ | 1.06⅞ | 1.07⅛ | 2,916,000 |
| Total sales | | | | | 13,344,000 |

### Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

BOSTON, Aug. 23.

The market for mining stocks, if the limited transactions of the past week at the regular brokers' board can be called a market, has lapsed into a state of chronic dullness, from which it will require a mighty effort to lift it. At the Boston Mining Exchange, there has been the usual trading in the two or three specialties dealt in; but there is no feature worthy of mention; in fact, a summer dullness pervades the whole atmosphere, and we can not look for much improvement, either in the volume of sales or in prices, until later in the season. In copper stocks, Calumet & Hecla sold in the early dealings at $245, but there being no orders to buy, a small lot was pressed for sale yesterday, and $241 was the result. To-day it sold at $240, and more offered at that price, with $235 as the best bid. Quincy steady at $45@$45½; but few sales were made, and the stock is not offered at less than $45½. Atlantic sold same as last week, at $10. Franklin, a small lot sold at $9½, but it is freely offered at $10, and no bids for round lots. Pewabic, firm at $3, which is bid, and none offered. The reports from this mine, as well as the Huron, continue of a favorable character. The rest of the list was neglected, and with no disposition to operate in any of the low-priced stocks.

In silver stocks, there is virtually nothing doing at the Board. Two hundred shares Catalpa at 40c., 200 Harshaw at 50c., 300 Sullivan at 87½c., and 1800 San Pedro at 25@17c. comprise all the recorded transactions for the week. At the Mining Exchange, Bowman Silver Company, at 16@18c.; Massachusetts & New Mexico, at 4@5c.; Catalpa, at 37½c., and Sullivan, at 80@92½c., are the principal stocks dealt in.

3 P.M.—There was no improvement in the market this afternoon. Closing prices: Calumet & Hecla, $245 asked. Allouez, $1¾ bid. Bonanza, $1⅛@$1¾. Franklin, $9½@$10. Osceola, $17 bid. Pewabic, $3 bid, $3½ asked. Quincy, $45 bid. Silver Islet, $3 bid. Sullivan, $⅞@$1. Bowman, 17c. bid. Massachusetts & New Mexico, 4@5c.

SAN FRANCISCO MINING STOCK QUOTATIONS.

*Daily Range of Prices for the Week.*

| NAME OF COMPANY. | CLOSING QUOTATIONS. Aug. 17. | Aug. 18. | Aug. 20. | Aug. 21. | Aug. 22. | Aug. 23. |
|---|---|---|---|---|---|---|
| Albion | .... | .... | .... | .... | .... | .... |
| Alpha | 2⅛ | 2 | 2 | .... | 2 | 2¼ |
| Alta | .55 | .70 | .... | .... | .... | .80 |
| Argenta | .25 | .... | .... | .... | .... | .... |
| Bechtel | .... | .... | .... | .... | .... | .... |
| Belcher | 1 | 1 | .... | .... | 1 | .... |
| Belle Isle | .25 | .... | .... | .... | .... | .... |
| Best & Belcher | 4⅛ | 4⅛ | .... | .... | .... | 4¼ |
| Bodie | .25 | .... | .... | .... | .... | .... |
| Bullion | .... | .... | .... | .... | .... | .... |
| Bulwer | .... | .... | .... | .... | .... | .... |
| California | .30 | .35 | .... | .... | .... | .40 |
| Chollar | 3⅛ | 3⅛ | .... | .... | .... | 3⅛ |
| Con. Virginia | .60 | .60 | .60 | .... | .60 | .65 |
| Crown Point | 1⅛ | 1⅛ | .... | .... | .... | 1⅛ |
| Elko Cons | .... | .... | .... | .... | .... | .... |
| Eureka Cons | 6 | 6⅛ | 6½ | .... | 6½ | 6½ |
| Exchequer | .... | .... | .... | .... | .... | .... |
| Gould & Curry | 2¾ | 3 | 3 | .... | 3 | 3⅛ |
| Grand Prize | .30 | .... | .... | .... | .... | .25 |
| Hale & Norcross | 5⅞ | 6 | .... | .... | .... | 6⅛ |
| Independence | .55 | .... | .... | .... | .... | .... |
| Martin White | .25 | .25 | .... | .... | .... | .... |
| Mexican | 3 | 3½ | 3½ | .... | 3½ | 3¾ |
| Mono | .... | .... | .... | .... | .... | .... |
| Mount Diablo | 4¾ | .... | .... | .... | .... | 4¼ |
| Navajo | 2½ | 2¾ | .... | .... | .... | 3 |
| Northern Belle | 6¼ | 6⅜ | .... | .... | 6⅛ | .... |
| North Belle Isle | .... | .... | .... | .... | .... | .... |
| Ophir | 3¼ | 3¼ | 3⅛ | .... | 3⅛ | 3 |
| Overman | .... | .... | .... | .... | .... | .... |
| Potosi | 1¼ | 1⅛ | 1¼ | .... | 1¼ | 1⅛ |
| Savage | 1⅞ | 2 | 2½ | .... | 2½ | 2½ |
| Scorpion | .55 | .55 | .... | .... | .... | .65 |
| Sierra Nevada | 4⅛ | 4⅜ | 4¼ | .... | 4¼ | 4¼ |
| Silver King | .... | .... | .... | .... | .... | .... |
| Tip-Top | .... | .... | .... | .... | .... | .... |
| Union Cons | 4⅝ | 5¼ | 5¼ | .... | 5¼ | 5⅝ |
| Utah | 2 | 2 | .... | .... | .... | 3 |
| Wales Cons | .... | .... | .... | .... | .... | .... |
| Yellow Jacket | 3 | 3⅛ | .... | .... | .... | 3¼ |

## BULLION MARKET.

NEW YORK, Friday Evening, Aug. 24.

There is nothing new to note of the silver market. It continues tolerably firm abroad, but with sterling exchange weak and declining here.

| DATE. | London. Pence. | N. Y. Cents. | DATE. | London. Pence. | N. Y. Cents. |
|---|---|---|---|---|---|
| Aug. 18 | 50½@50⅝ | 110½ | Aug. 22 | 50⅝ | 110¼ |
| 20 | 50½@50⅝ | 110½ | 23 | 50⅝ | 110¼ |
| 21 | 50½@50⅝ | 110⅜ | 24 | 50⅝ | 110⅜@110¼ |

*Bullion Receipts at New York.*—The bullion received from the mines at the various offices in this city during the week ended August 24th, as compiled from various sources, amounted to $214,000, as against $210,000, reported for the previous week. The receipts from January 1st, 1883, to date are $7,391,974.

*Exports and Imports of Gold and Silver at New York.*

*Exports.*

| | |
|---|---|
| Week ended August 18th | $195,000 |
| Corresponding week last year | 298,435 |
| Since January 1st, 1883 | 8,331,524 |
| Corresponding period last year | 42,748,698 |

*Imports.*

| | |
|---|---|
| Week ended August 18th | $370,168 |
| Corresponding week last year | 108,161 |
| Since January 1st, 1883 | 8,221,833 |
| Corresponding period last year | 2,369,962 |

*Foreign Bank Statements.*—The governors of the Bank of England have made no change in the bank's minimum rate for discount, and it remains at 4 per cent. During the week, the bank gained £243,000 bullion, and the proportion of its reserve to its liabilities was raised from 46 9-16 to 49 11-16 per cent, against 38⅝ per cent at this date a year ago. August 23d, the bank made a further gain of £59,000 bullion on balances. The weekly statement of the Bank of France shows a loss of 1,275,000 francs in gold and a gain of 1,900,000 francs in silver.

### BULLION PRODUCTION FOR 1883.

We give below a statement showing the latest bullion shipments. These are officially obtained from the companies, where that is possible; and where official statements can not be procured, we take the latest shipments published in those papers nearest to the mines reported. The table gives the amount shipped for the week up to the date given, as well as the aggregate shipments to such date from the first of January, 1883.

The shipments of silver bullion are valued at $1.29·29 per ounce troy; gold at the standard $20.67 per ounce troy. The actual value of the silver in the following table is therefore subject to a discount, depending on the market price of silver. If the price of silver be counted at $1.11 an ounce, which has for some months been about its average value, the following figures, where they relate to silver bullion, should be diminished by about 14¼ per cent, to arrive at actual value.

| Mines. | States. | Month of July. | Year from Jan. 1st, 1883. |
|---|---|---|---|
| *Alice, G. S. | Mont | | ‡$471,323 |
| *Alta-Montana, G. L. S. | " | | $10,625 |
| *Belmont | " | | 12,604 |
| Bodie, G. S. | Cal | 12,447 | 161,728 |
| Bodie Tunnel, G | " | | 52,742 |
| *Bonanza King, G. | " | 45,211 | 379,434 |
| *Boston & Montana, G. | Mont | | 72,318 |
| *Central Arizona, S. | Ariz | | 35,845 |
| *Christy, S. | Utah | | 145,671 |
| *Chrysolite, S. L | Colo | | 246,676 |
| Consolidated Bobtail | Colo | | 18,723 |
| *Contention, S. | Ariz | 77,985 | 635,413 |
| Crescent, G. | Cal | | 13,000 |
| *Custer, G. S. | Idaho | | 43,572 |
| *Deadwood-Terra, G. | Dak | | 172,277 |
| *Derbec Blue Gravel, G. S. | Cal | 17.122 | 72.270 |
| Dunkin, S. L. | Colo | | 32,015 |
| Evening Star, S. L | Colo | | 47,061 |
| *Father de Smet, G. | Dak | 30,688 | 208,851 |
| *Frisco M. and S. Co., G. S. L. | Utah | | $77,084 |
| Gunnell, S | Colo | | 58,828 |
| *Head Center Consolidated | Ariz | | 26,502 |
| *Head Center and Tranquillity | Ariz. | | 60.620 |
| *Hecla Consolidated, G. S. | Mont | | 293,922 |
| *Homestake, G | Dak. | | 419.148 |
| *Hope, S | Mont | 20,484 | 62,447 |
| Horn-Silver, S. L | Utah | 300,000 | 1,847,000 |
| *Howell S. and Mg. Co., G. S. L. | Ariz | $41,361 | 41,361 |
| Idaho, G | Cal | | 88,642 |
| *Independence, G. S. | Nev | —— | 32,991 |
| Iron Silver, S. L | Colo | | 503,831 |
| *Jocuistita, S | Mex | | ‡228,022 |
| *Kentuck, G. S | Nev | | 12,876 |
| *Lexington, S | Mont | 106,068 | 744,556 |
| *Little Pittsburg, S. L | Colo | 6.446 | 42,091 |
| *Marguerite, G | Cal | | 45,745 |
| *Martin White, G. S | Nev | —— | 136.317 |
| Morning Star, S. D | Colo | | 84,428 |
| *Moulton, G. S. | Mont | | 123,288 |
| Mount Diablo | Nev | 74,277 | 262,100 |
| *Navajo, G. S. | " | | 411,642 |
| *North Belle Isle | " | | 2,153 |
| Northern Belle, S | " | 51,134 | 447,040 |
| *Ontario, S. L | Utah | | 1,038,687 |
| *Oxford, G | N. S | 5,276 | 40,531 |
| *Phœnix, G | S. C | 3,000 | 10,700 |
| *Pinal Consolidated, S. L | Ariz | | 181.485 |
| *Satemo, G. | N. S. | | 2,500 |
| *Silver Bow, G. S. | Mont | | 101,241 |
| Standard, G | Cal | 95,209 | 738.401 |
| Star, S | Nev | | 27,095 |
| *Stormont, S | Utah | 18,020 | 132,330 |
| Syndicate, G | Cal | 9.300 | 38,428 |
| Tintic M. and M. Co | Utah | 10,595 | 25,196 |
| *Tip Top, S. | Ariz | 10,009 | 37,868 |
| *Tombstone, G. S. L. | " | 82,960 | 497,190 |
| Wyoming Consolidated | Cal | | 31,541 |
| Yellow Jacket, S | Nev | 72,227 | 265,885 |
| Total amount of shipments to date | | | $12,053,857 |

* Official. † Net value. ‡ Assay value. § Not including alue of lead. *G. Gold. S. Silver. L. Lead.*

## METALS.

New York, Friday Evening, Aug. 24.

**Copper.**—There is not much change in the situation. Current demand and offerings are very moderate, and there is as yet no movement looking toward prices for the next contract sales, which are due some time next month, unless negotiations are protracted. England is unchanged.

The *American Architect* has the following on copper roofing, which is of great importance to the trade: The *Scientific American* mentions the decline in the price of copper as likely to lead to the increased use of that metal in building. At present, the material for a copper roof costs, at the outset, only about twice as much as tin, and as the latter must be repaired and painted about once in three years, and in fifteen or twenty years must be renewed altogether, the copper, which never needs painting, and is practically indestructible, is much the cheaper material in the end. There are in Boston many copper roofs, put on about forty years ago, which show no signs of deterioration; and the metal is still much employed in that city for cornices, gutters, and rain-water pipes, as well as for covering bay-windows, and in many other ways, in place of galvanized iron, which is much inferior in beauty and durability, and not very much cheaper. The copper has the additional advantage of needing no paint, so that the delicate lines o artistic work are in no danger of being filled up, and the metal increases rather than diminishes in beauty, by the slow formation of a bluish-green patina over it. For flashings, as well as other portions of roofwork, copper is much superior to zinc or tin, and with the aid of a certain amount of lead, the most difficult problems in roofing can be successfully and permanently solved.

The following are the British Board of Trade returns for the first seven months of the year:

| | Jan. 1 to July 31. 1883. Tons. | 1882. Tons. | 1881. Tons. |
|---|---|---|---|
| Imports: | | | |
| Pure in pyrites | 9,853 | 9,871 | 8,170 |
| " precipitate | 12,253 | 10,385 | 11,685 |
| " ore | 8,312 | 8,361 | 8,472 |
| " regulus | 5,770 | 4,779 | 3.053 |
| Bars, cakes, etc | 20,247 | 16,088 | 18,335 |
| | 56.435 | 52,484 | 49.715 |
| Exports: | | | |
| Raw (English) | 9,736 | 6,870 | 10,989 |
| Sheets | 9,279 | 8,677 | 7,686 |
| Yellow metal at 60 per cent | 6,646 | 6,475 | 5,192 |
| Brass at 70 per cent | 1,950 | 1,835 | 1,813 |
| | 27,611 | 23,857 | 25.680 |
| Foreign | 7,203 | 6,875 | 7,463 |
| | 34,814 | 30,732 | 33.143 |

**Tin.**—Sales during the week aggregate about 200 tons at 21@21¼c. spot, which we quote for long lines while jobbing lots, 30 days, bring 21⅝c. London cables £93 15s.@£94.

**Lead.**—The deadlock in this metal continues. Offerings are light, though stocks are known to be heavy, a fact which encourages consumers in the belief that lower prices may be looked forward to. Common has been selling in jobbing lots at 4·20@4·25c.

Messrs John Wahl & Co., of St. Louis, wire us as follows to-day:

Our market is dull and quiet, and prices are unchanged. We quote: Refined lead, 4c.; and Common, 3·92½@3·95c.

Messrs. Everett & Post, of Chicago, send us the following dispatch:

In consequence of a considerable increase in the inquiry for both common and refined lead, a little more is asked by sellers. Business has, however, been only moderate in amount, transactions for the week footing up to 700 tons of common and refined. Our market is nominally 4·05@4·07½c.

**Spelter.**—Very little is doing. We quote 4⅜@4⅝c. nominally for good ordinary Western.

**Antimony.**—This metal is quiet, quotations remaining 10¼c. for Cookson's and 9¼c. for Hallett's, for jobbing lots.

## IRON MARKET REVIEW.

New York, Friday Evening, Aug. 24.

The following are the quantities of iron and steel sent from Great Britain to this country for the first seven months of this year, ended July 31st:

| | 1881. Tons. | 1882. Tons. | 1883. Tons. |
|---|---|---|---|
| Pig-iron | 217,641 | 274,171 | 168,801 |
| Old iron for remanufacture | 50,589 | 59,665 | 36,143 |
| Steel unwrought | 63,095 | 104,349 | 23,641 |
| Tin plates | 96,871 | 127,962 | 120,620 |
| Hoops and sheets | 16,724 | 18,816 | 19,153 |
| Bar, angle, bolt, and rod | 7,421 | 13,276 | 6,398 |
| Railroad iron and steel | 186,491 | 142,023 | 40,144 |

**American Pig.**—Business has been restricted to small lots, buyers pursuing strictly a hand-to-mouth policy. We hear of the sale of a lot of from 800 to 1000 tons, but are unable to learn the particulars. No. 1 Foundry continues firm at $21.50@$23 for standard and choice, while No. 2 is still in a less favorable position, showing occasional signs of weakness. We quote $19@$21, according to quality, while inferior to choice Gray Forge fetches from $18@$20, all at tide-water. In Bessemer pig, another sale of 5000 tons of foreign is reported at a little less than $21 at tide-water, and $21 full is now quoted. In Spiegeleisen, sales of 2000 tons of lower grade are mentioned at $25.50@$25.75, while higher grades are quiet at $30.50.

**Scotch Pig.**—Business during the week has been dull at about our quotations. Arrivals are heavier this week, aggregating 2000 tons, and freights are cabled lower, 5@6s. from Glasgow.

We quote ex ship: Coltness, $23.75@$24; Langloan, $23.75@$24; Summerlee, $23; Dallmellington, $21@$21.50; Eglinton, $20.50@$21; and Glengarnock, $22.50@$23.

At the Exchange, the following slightly lower cable quotations were received: Coltness, 60s. 6d.; Langloan, 59s. 3d.; Summerlee, 57s.; Gartsherrie, 56s. 3d.; Glengarnock, at Ardrossan, 55s. 3d.; and Eglinton, at Ardrossan, 48s. 6d.

**Rails.**—Current business is small and unimportant. There are orders on the market for 50,000 tons of rails for delivery early in 1884; but as yet buyers and sellers have been unable to come to terms, buyers' views being in some cases as low as $36, which the mills show no eagerness to meet.

**Old Rails.**—Holders' views are still high, and business is limited, though inquiries are more numerous. We quote nominally $22.50@$23.

**Scrap.**—Spot stock and arrivals are light, and business is dull on the basis of $22.50@$23 ex ship for No. 1.

### Philadelphia. August 23.

*Pig-Iron.*—Buyers still hold back, and sellers still refuse to make the concessions desired, to secure the placing of fall and winter orders. The situation has changed but little for the past week. Furnace-men are waiting for a demand which will at least prevent any further downward tendency, for which they say there is no room. Standard No 1 Foundry iron, tide-water quotation, $22@$23; Common, $21@$21.50; No. 2, $20@$21; ordinary makes, $19@$19.50. No large sales were closed this week. A number of negotiations are in hand, but buyers have no reason for purchasing largely, and sellers seem indifferent. Representatives of the stronger companies think buyers are making a mistake in failing to come forward when iron can be had at $17.50 at furnace, and fair No. 1 Foundry at $22. There are offers at $17 for Forge, and $21.75 for Foundry. Bessemer iron is quiet and firm at $21. Transactions for the week, 12,000 tons. Spiegeleisen, $25.50 and $31, according to per cent; sales, 4000 tons.

*Blooms.*—But few large buyers are around. Some sales took place at $56@$58 for Charcoal and $46@$48 for anthracite.

*Merchant Iron.*—Selling prices are unchanged; 2·10@2·15c. is offered; 2·15@2·20c. asked, according to size of order. The market is weak, and prices fluctuating. Manufacturers are not willing to sell good iron under 2·15c., and buyers think they can secure stocks later on at 2·10c. Small lots of Refined are firm at 2·20c.

*Plate and Tank-Iron.*—Plate-Iron is in fair demand for small lots, chiefly at 2·40c. for Angles, 3@3·25c. for Shell, and 4 4·25c. for Flange.

*Sheet-Iron.*—A fair number of small orders were placed at 4@4½c. for Common, and 6@6·50c. for Bloom Sheets. Galvanized is in good request, and large orders are in negotiation.

*Structural Iron.*—Makers report fair inquiry. Moderate business and firm prices at 3·50c. for Channels and Beams.

*Steel Rails.*—Prices are firm at $38@$38.50 for fall delivery, and negotiations are about closing for large lots for winter and spring deliveries somewhere from $36 up.

*Old Rails.*—Prices are quoted at $23 for Tees and $25.50 for Double Heads, with 50c.@$1 less offered. No sales heard of.

*Scrap.*—Scrap is dull and weak at $23@$25.

### Pittsburg. August 22.

The Home furnaces are well sold up, but the outside furnaces are accumulating stocks, and the agents representing them are in town, making very attractive offers, but so far, without the desired success. There will be a steady consumption of iron during the fall; but thus far, consumers see no reason for buying more than a mouth or two ahead, notwithstanding some very tempting offers. Nearly all the business done is in from 100 to 200-ton lots. The highest sale of last week was for 1000 tons of Neutral Forge at $18. There were three or four sales of all-ore Forge at $19; Silvery, $18; Foundry Iron, $20@$21; Mottled Iron, $17. There are quite a number of inquiries for fall deliveries, and some fair offers, but transactions can not be closed excepting at concessions which makers are unable and unwilling to make. Cropends are without sale. Scrap is $13@$14 for cast bowings. Old Car-Wheels, $20. Selected Yard, $22@$23; No. 2, $21@$22. Spikes are 2·60c. Splice Bars, 1·90c. Track Bolts, 3@3·25c. Wrought Pipes are 70 and 10 to 75 off. Boiler Tubes are 57½ to 60 off. The demand for merchant steel is quite active, but for near-by requirements altogether. Prices are unchanged. Old Rails are quoted at $23. Stocks are absorbed. Muck Bars, $34. Merchant

# NEW YORK MINING STOCKS.

## DIVIDEND-PAYING MINES.

| NAME AND LOCATION OF COMPANY. | HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE. | | | | | | | | | | | | SALES. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Aug. 18. | | Aug. 20. | | Aug. 21. | | Aug. 22. | | Aug. 23. | | Aug. 24. | | |
| | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | |
| Alice, Mon. | 2.40 | ..... | 2.40 | ..... | 2.40 | ..... | 2.25 | 2.00 | 2.00 | ..... | ..... | ..... | 1,500 |
| Amie Con., Co. | .14 | ... | .. | ..... | ..... | ..... | .15 | .14 | ..... | ..... | ..... | ..... | 3,000 |
| Argenta, Ne. | .20 | ..... | .. .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .. .. | ..... | 400 |
| Bar. & Walker, Ut. | ..... | .. .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .. .. | ..... | ... |
| Bassick, Co. | ..... | ... .. | ..... | ..... | 9.75 | ..... | ..... | ..... | 9.50 | ..... | .. .. | ..... | 300 |
| Belle Isle, Ne. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bodie Cons., Ca. | ..... | ..... | .25 | ..... | ..... | ..... | ..... | ..... | .25 | ..... | ..... | ..... | 300 |
| Breece, Co. | ..... | ..... | .. .. | .. .. | .18 | ..... | .21 | ..... | .. | ..... | .23 | ..... | 2,600 |
| Bulwer, Ca. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .70 | ..... | ..... | ..... | 100 |
| California, Ne. | .35 | ..... | .. .. | ..... | ..... | ..... | ..... | ..... | .39 | ..... | .40 | ..... | 2,920 |
| Cal. & Hecla, Mich. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Carbonate Hill | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Caribou Con., Co. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Chrysolite, Co. | 1.10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1.00 | ..... | 500 |
| Cons. Va. Ne. | .60 | ..... | .65 | .57 | .60 | ..... | .35 | .33 | .66 | .63 | .66 | .65 | 6,650 |
| Crown Point | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Deadwood-Terra, Dk. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Dunkin, Co. | .23 | ..... | ..... | ..... | .23 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 500 |
| Eureka Cons., Ne. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Excelsior, Ca. | ..... | ... .. | .. .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Father de Smet, Dk. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Findley, Ga. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Gold Stripe, Ca. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Gould & Curry, Ne. | ..... | ... .. | 2.85 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100 |
| Grand Prize, Ne. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Great Eastern, Dk. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .01 | ..... | 700 |
| Green Mountain, Ca. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Hale & Norcross, Ne. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Hall-Anderson, N. S. | ..... | ... .. | ..... | ..... | ..... | ..... | 1.05 | 1.00 | 1.00 | ..... | 1.05 | ..... | 1,000 |
| Hibernia, Co. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Homestake, Dk. | ..... | ... .. | 17 75 | 17.63 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 50 |
| Horn-Silver, Ut. | 6.50 | 6.25 | 6.63 | ..... | 6.75 | 6.63 | ..... | ..... | 6.75 | ..... | 6.75 | ..... | 1,960 |
| Hukill, Co | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Independence, Ne. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Iron Silver, Co. | 3.10 | 3.00 | ..... | ..... | ..... | ... .. | 3.20 | ..... | ..... | ..... | ..... | ..... | 1,320 |
| La Plata, Co. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Leadville C., Co. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Little Chief, Co. | ..... | ... .. | ..... | ..... | .40 | ..... | ..... | ..... | .35 | ..... | .45 | .40 | 1,700 |
| Little Pittsburg, Co. | .70 | ... .. | ..... | ..... | ..... | ..... | .65 | .60 | .60 | ..... | ..... | ..... | 525 |
| Martin White, Ne. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .15 | ..... | 50 |
| Moose, Co. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Navajo, Ne. | ..... | ... .. | ..... | ..... | ..... | ..... | 2.90 | ..... | ..... | ..... | ..... | ..... | 200 |
| Northern Belle, Ne. | ..... | ... .. | ..... | ..... | ..... | ..... | 6.75 | ..... | 6 50 | ..... | ..... | ..... | 400 |
| North Belle Isle, Ne. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ontario, Ut. | 30.00 | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 31.50 | 29.25 | 150 |
| Opair, Ne. | 3.00 | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 300 |
| Plumas, Ca. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Prussian, Colo. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Quicksilver Pref., Ca. | 33.00 | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100 |
| " Com., Ca. | 2.00 | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Rising Sun, Ca. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Robinson Cons., Co. | .64 | .63 | .63 | .62 | .62 | .60 | .61 | .60 | .60 | .57 | .57 | .49 | 39,700 |
| Saint Joseph's Lead. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Savage, Ne. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1.80 | ..... | 100 |
| Sierra Grande, N. M. | ..... | ... .. | 1.15 | ..... | ..... | ..... | 1.05 | ..... | ..... | ..... | 1 05 | ..... | 2,500 |
| Sierra Nevada, Ne. | 4.00 | ... .. | ..... | ..... | 4.20 | ..... | ..... | ..... | ..... | ..... | 4.10 | ..... | 225 |
| Silver King, Ar. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Spring Valley, Ca. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Standard, Ca. | ..... | ... .. | 6.00 | ..... | ..... | ..... | 5.50 | ..... | 6.00 | ..... | 6.00 | 5.50 | 360 |
| Stormont, Ut. | .20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 500 |
| Tip Top, Ar. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Tombstone, Ar. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Vizina, Ar. | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Yellow Jacket | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ... .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

## NON-DIVIDEND-PAYING MINES.

| NAME AND LOCATION OF COMPANY. | HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE. | | | | | | | | | | | | SALES. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Aug. 18. | | Aug. 20. | | Aug. 21. | | Aug. 22. | | Aug. 23. | | Aug. 24 | | |
| | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | H | L. | |
| Albion | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Alta-Montana, G. | .06 | .05 | .06 | .05 | .05 | ..... | .05 | ..... | .06 | ..... | .05 | ..... | 10,100 |
| Am. Flag, S. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Barcelona, G. | .39 | .38 | ..... | ..... | .38 | ..... | ..... | ..... | .37 | ..... | .37 | .34 | 18,100 |
| Bear Creek | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bechtel Con., G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Belvidere | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Best & Belcher, G. S. | ..... | ..... | 3.90 | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 50 |
| Big Pittsburg, S. L. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bradshaw, S. | ..... | ..... | .26 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 700 |
| Buckeye | ..... | .. .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| " pref. | ..... | .. .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bull-Domingo, S. L. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bye and Bye | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Calaveras, G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| C'lav'r'a W. & M. Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cal., B. H., G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .02 | ..... | ..... | ..... | 100 |
| Central Ariz'na, S. | .20 | .15 | ..... | ..... | ..... | ..... | ..... | .20 | ..... | ..... | ..... | ..... | 600 |
| Cherokee, G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Climax, Co. | .09 | ..... | .09 | ..... | ..... | ..... | ..... | ..... | .10 | ..... | ..... | ..... | 2,700 |
| Cons. Imp'r'l, G. S. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .05 | ..... | 500 |
| Crowell, G. | ..... | ..... | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Dahlonega, G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Decatur | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .02 | ..... | ..... | ..... | 500 |
| Dunderberg | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Durango, G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Eastern Oregon | .94 | .92 | .95 | .94 | .95 | .94 | .96 | .95 | .96 | .95 | .98 | 96 | 8,200 |
| Elko Cons. | .15 | .14 | .14 | ..... | ..... | ..... | ..... | ..... | .12 | .11 | .10 | ..... | 3,300 |
| Enterprise | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Fannie Barret | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Globe Copper | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Gold Placer, G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Goodshaw, G. | ..... | ..... | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Granville, G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Hariem M. & M. Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Hortense, S. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Imperial | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Lacrosse, G. | .09 | ... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100 |
| Lucerne | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mariposa Pref., G | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| " Com., G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mexican, G. S. | 3.35 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3.75 | ..... | ..... | ..... | 300 |
| Miner Boy | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mono | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| North Standard, G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| N. Horn-Silv'r, S. L. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Pri'n'l & Miller, S. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Parnell | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Quartz Creek | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Rappanannock, G. | ..... | ..... | .36 | ... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5,500 |
| Red Elephant, S. | .06 | ..... | ..... | ..... | ..... | ..... | ..... | .06 | .. | ..... | ..... | ..... | 200 |
| Ruby, of Arizona | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Silver Cliff, S. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Sonora Con. | .23 | .24 | ..... | ..... | ..... | .26 | .25 | .25 | ..... | .25 | ..... | .26 | .25 | 12,600 |
| South Bodie, G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| South Bulwer, G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| South Hite | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| South Pacific | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .. | ..... | ..... | ..... | ..... | ..... |
| State Line, 1 & 4, S. | ..... | ..... | ..... | ..... | ..... | .03 | ..... | ..... | ..... | ..... | ..... | ..... | 50 |
| " Nos. 2 & 3, S. | ..... | ..... | ..... | ..... | ..... | .19 | ..... | .20 | ..... | .21 | .20 | .20 | 6,150 |
| Sutro Tunnel | .20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Taylor Plumas | ..... | .. .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Tioga | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Unadilla, S. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .01 | ..... | ..... | ..... | 200 |
| Union Cons., G. S. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 71,710. Non-dividend shares sold, 70,300.

## BOSTON MINING STOCKS.

| | Aug. 17. | | Aug. 18. | | Aug. 20. | | Aug. 21. | | Aug. 22. | | Aug. 23. | | Sales. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | |
| Allouez | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Amie | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Atlantic | ..... | ..... | ..... | ..... | 10.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 25 |
| Aztec | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bodie Con. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bonanza D. | 1.63 | ..... | ..... | ..... | ..... | ..... | 1.63 | ..... | ..... | ..... | 1.63 | ..... | 300 |
| Bowman Sil | .17 | .16 | .17 | .16 | .18 | .16 | .17 | ..... | .17 | ..... | .17 | ..... | 19,400 |
| Bruns. Ant. | ..... | .. .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bulwer | ..... | .. .. | ..... | ..... | .70 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100 |
| California | ..... | .. .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cal. & Hec. | 245 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 241 | ..... | 240 | ..... | 21 |
| Catalpa | ..... | ..... | ..... | ..... | ..... | ..... | .40 | .37½ | .37½ | ..... | ..... | ..... | 1,500 |
| Central Ariz | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Climax | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Co. Virginia | ..... | ..... | ..... | ..... | .62 | ..... | .61 | ..... | ..... | ..... | ..... | ..... | 500 |
| Copper Falls | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Copperop. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Crescent | ..... | ..... | ..... | ..... | .15 | ..... | ..... | ..... | .15 | ..... | .15 | ..... | 400 |
| "Cusi" | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Decatur | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Deer Isle | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .04 | ..... | 1,000 |
| Denver City | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Douglas | .60 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 300 |
| Duncan | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Dunkin | .24 | ..... | ..... | ..... | ..... | ..... | .25 | ..... | ..... | ..... | ..... | ..... | 200 |
| Empire | ..... | ..... | .16 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 500 |
| Eureka Con. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Franklin | 9.75 | ..... | ..... | ..... | 9.75 | 9.50 | ..... | ..... | ..... | ..... | 9.75 | ..... | 65 |
| Hancock G. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Harshaw | ..... | ..... | .50 | ..... | .50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 300 |
| Hukill | ..... | ..... | ..... | ..... | .04 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,100 |
| Independ'ce | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Indian Q'n. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Little Pitts. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mammoth | .03 | ..... | .04 | .03 | ..... | ..... | ..... | ..... | ..... | ..... | .02 | ... | 19,750 |
| Mass. & N.M. | .04 | ..... | .05 | .04 | .05 | ... | .05 | .04 | .05 | ..... | ..... | ..... | 15,000 |
| Milton | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Napa | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| National | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| North Belle | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ontario | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Osceola | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Penn-Breck. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Pewabic | 3.00 | ..... | ..... | ..... | ..... | ..... | 3.25 | ..... | ..... | ..... | ..... | ..... | 125 |
| Pine Tree | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Plymouth | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Quicks.-com | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Quincy | ..... | ..... | 45.00 | ..... | 45.50 | ..... | 45 50 | 45.00 | 45.28 | ..... | 45.50 | ..... | 137 |
| Robinson | ..... | ..... | ..... | ..... | ..... | ..... | .63 | ..... | ..... | ..... | .62 | ..... | 3 0 |
| San Pedro | .25 | ..... | .20 | ..... | .20 | ..... | ..... | ..... | ..... | ..... | .17 | ..... | 1,800 |
| S'ra Nevada | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| S'ra Grande | ..... | ..... | 1.10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 200 |
| Silver Islet | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Silver King | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Simpson Gd | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| So. Pacific | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Standard | 6.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 15 |
| Sullivan | ..... | ..... | ..... | ..... | .85 | .80 | .85 | .80 | .87½ | .84 | .92½ | .87½ | 2,900 |
| Sutro Tun. | .20 | ..... | ..... | ..... | .20 | ..... | ..... | ..... | ..... | ..... | .20 | ..... | 500 |
| Sycamore | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Twin Lead. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Vizina | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

## PHILADELPHIA MINING STOCKS.

| | Aug. 17. | | Aug. 18. | | Aug. 20. | | Aug. 21. | | Aug. 22. | | Aug. 23. | | Sales |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | |
| Amer. Cons. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Argent | .15 | .14 | .14 | ..... | .15 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7,300 |
| Aztec | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Battle Mt. | ..... | ..... | ..... | ..... | .03 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,000 |
| Buena | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| California | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Calista | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Chrysolite | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cincinnati | .11 | .10 | .10 | .09 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8,700 |
| Comprom'e. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Contention | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Con. Virg. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Dauntless | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Del Monte | .05 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 400 |
| Denver City | ..... | ..... | ..... | ..... | .11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,500 |
| Eureka | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Girard | .03 | .02 | ... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,000 |
| Governor | .05 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100 |
| Grand Uni'n | .03 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2, 00 |
| Green Mt. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Gunnison | .27½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,000 |
| Homestake | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Horn Silver | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Iowa Gulch | .05 | ..... | .06 | ... | .05 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 13,000 |
| Iron Silver | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| King Bul'on | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ledger Con. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Little Dia'd. | ..... | ..... | .06 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6,000 |
| Little Maud | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Little Pitts. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| L'g & D'y H | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Montana | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,500 |
| Mt. Sheridan | ..... | ..... | .06 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| National | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| North'n B'l. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Orion | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Orion Pref. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Palmetto E. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Pembina | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Penn-Breck. | .06 | .05 | .10 | .05 | .09 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 19,100 |
| Permanent | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Pizarro | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Pizarro Ex. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Potosi | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Rara Avis | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .....

iron is weak and dull, with indications of a stronger competition, which will probably depress prices to 1·8Cc. Nails are in fair demand at $2.90.

## COAL TRADE REVIEW.

NEW YORK, Friday, Aug. 24.

### Anthracite.

The future course of the coal companies is a matter which is discussed with considerable anxiety just now, and there is considerable complaint in the trade that the consideration of the interest of many of the magnates to sustain their operations in Wall street and other financial centers is more potent than the regard for the interests of the trade. Every effort is made on the part of some to create the impression that the anthracite coal trade is enjoying a period of unalloyed prosperity, which will warrant not only a continuance of the present heavy production, but also an upward movement in prices. A number of the New York companies, which are not forced to take extraordinary measures to meet current obligations, appear willing to face the situation as it is and take the course which a wise business policy dictates. Some of them are accumulating coal, having a large quantity afloat in this harbor, and a large number of cars standing on the tracks. Even with the concessions they may be willing to make, they can not market all their coal freely. If buyers merely held off because they believed that there would be a better chance to put in supplies later, it would be a good plan to put up the nominal circular prices, and scare the unwilling into ordering or make them pay more later on. The fact is, however, that the quantity of coal used by one important element in the trade is less than it was last year. So far as the Eastern manufacturers are concerned, it needs no more eloquent proof of their position than to point to the great auction sales of dry goods the other day. It is true that the East is the weakest spot in the country, but it can not be denied that throughout New York, New Jersey, and Pennsylvania the manufacturing industries are in a less degree restricting work. The West is loaded up with coal, and at Buffalo there are miles of loaded cars upon which advances have been made. It will not do, therefore, to argue that the Western markets can be stocked to harden prices elsewhere. In this vicinity, retailers have bought as much as they care to take for the present at June prices, and some of them have bought for delivery to the end of this month. With these facts before them, it is not astonishing that there are many who are unable to see that it would do any good to go on producing at the present rate and at the same time announce higher circular rates. The latter are out of the question on those sizes which come into competition with low-priced bituminous coals. For other sizes, it is possible only by curtailing the production, at least temporarily. The position of the coal trade to-day is not much better or any worse than that of any other leading industry, and the efforts to make the public believe that it is exceptionally situated can only react unfavorably upon it. Those in the trade know enough of the actual situation. A single effort to buy cheaply or to place a lot of coal with a buyer will reveal it. Those who want to buy will simply restrict their requirements, if an effort is made to put up the price without restricting the supply.

### Bituminous.

There is nothing new in bituminous coal.

## STATISTICS OF COAL PRODUCTION.

*Belvidere-Delaware Railroad Report for the week ended August 18th:*

| | Week. | Year. 1883. | Year. 1882. |
|---|---|---|---|
| Coal for shipment at Coal Port (Trenton) | 3,341 | 68,188 | 55,694 |
| Coal for shipment at South Amboy | 11,735 | 483,822 | 528,482 |
| Coal for distribution | 14,471 | 488,266 | 442,262 |
| Coal for company's use | 3,152 | 98,788 | 79,408 |
| Total | 32,699 | 1,142,064 | 1,105,846 |
| Increase | | 36,218 | |
| Decrease | | | |

Comparative statement of the production of anthracite coal for the week ended August 18th, and year from January 1st:

| TONS OF 2240 LBS. | 1883. Week. | 1883. Year. | 1882. Week. | 1882. Year. |
|---|---|---|---|---|
| *Wyoming Region.* | | | | |
| D. & H. Canal Co. | 93,181 | 2,333,846 | 79,685 | 2,097,951 |
| D. L. & W. RR. Co. | 124,223 | 2,954,786 | 109,564 | 2,742,072 |
| Penna. Coal Co. | 36,130 | 844,522 | 33,161 | 826,485 |
| L. V. RR. Co. | 24,687 | 834,678 | 42,406 | 676,565 |
| P. & N. Y. RR. Co. | 5,152 | 128,400 | 3,875 | 122,515 |
| C. RR. of N. J. | * | 1,202,078 | 38,651 | 1,432,577 |
| Penna. Canal Co. | 16,703 | 253,469 | 15,123 | 273,956 |
| North & West Br. RR. | 6,870 | 280,919 | ..... | ..... |
| | 306,949 | 8,832,698 | 322,465 | 8,172,121 |
| *Lehigh Region.* | | | | |
| L. V. RR. Co. | 104,228 | 2,970,377 | 98,912 | 2,902,879 |
| C. RR. of N. J. | * | 1,126,889 | 49,752 | 1,349,383 |
| S. H. & W. B. RR. | 2,380 | 36,577 | ..... | 40,987 |
| | 106,608 | 4,133,843 | 148,664 | 4,293,249 |
| *Schuylkill Region.* | | | | |
| P. & R. RR. Co | 160,220 | 4,314,546 | 141,551 | 4,044,149 |
| Shamokin & Lykens Val. | 34,112 | 885,083 | 31,205 | 756,522 |
| | 194,332 | 5,199,629 | 172,756 | 4,800,671 |
| *Sullivan Region.* | | | | |
| St Line&Sul.RR.Co. | 1,098 | 38,513 | 590 | 35,125 |
| Total | 608,987 | 18,204,683 | 644,475 | 17,301,166 |
| Increase | | 903,517 | | |
| Decrease | | | | |

* Included in tonnage of Philadelphia & Reading Railroad.

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Total same time in 1878..... 9,674,392 tons.
" " " " 1879..... 15,374,328 "
" " " " 1880..... 13,195,348 "
" " " " 1881..... 16,798,470 "

*The increase in shipments of Cumberland Coal* over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 560,453 tons, as compared with the corresponding period in 1882.

**The Production of Bituminous Coal** for the week ended August 18th was as follows:

Tons of 2000 lbs., unless otherwise designated

| | Week. Tons. | Year. Tons. |
|---|---|---|
| *Cumberland Region, Md.* | | |
| Tons of 2240 lbs | 59,225 | 1,494,909 |
| *Barclay Region, Pa.* | | |
| Barclay RR., tons of 2240 lbs. | 6,791 | 195,069 |
| *Broad Top Region, Pa.* | | |
| Huntingdon & Broad Top RR. | 3,102 | 114,584 |
| East Broad Top | 267 | 26,469 |
| *Clearfield Region, Pa.* | | |
| Snow Shoe | 4,441 | 147,195 |
| Tyrone and Clearfield | 49,548 | 1,758,545 |
| *Alleghany Region, Pa.* | | |
| Pennsylvania RR. | 8,245 | 273,536 |
| *Pittsburg Region, Pa.* | | |
| West Penn RR. | 4,251 | 260,748 |
| Southwest Penn. RR. | 1,992 | 66,580 |
| Penn & Westmoreland gas-coal, Pa. RR | 36,315 | 857,940 |
| Pennsylvania RR | 15,247 | 353,636 |
| Total | 189,424 | 5,549,151 |

**The Transportation of Coke** over the Pennsylvania Railroad for the week ended August 18th, and year from January 1st:

| Tons of 2000 lbs. | Week. | Year. |
|---|---|---|
| Penn. RR. (Alleghany Region) | 956 | 54,663 |
| West Penn. RR. | 1,310 | 65,837 |
| Southwest Penn. RR | 43,130 | 1,305,929 |
| Penn. & Westmoreland Region, Pa. RR | 3,600 | 140,246 |
| Pittsburg, Penn. RR. | ... | 501 |
| Snow Shoe (Clearfield Region) | 192 | 12,206 |
| Total | 49,188 | 1,579,382 |

**The Horsford Almanac and Cook Book** mailed free on application to the
RUMFORD CHEMICAL WORKS,
Providence, R. I.

## DIVIDENDS.

HOMESTAKE MINING COMPANY, MILLS BUILDING,
NEW YORK, Aug. 13, 1883.
DIVIDEND NO. 60.

The regular monthly dividend of FORTY CENTS per share has been declared for July, payable at the office of the Transfer-Agents, Lounsbery & Haggin, Mills Building, 15 Broad street, on the 25th inst.
Transfer-books close on the 20th inst.
LOUNSBERY & HAGGIN, Transfer-Agents.

SAN FRANCISCO, Aug. 4, 1883.

THE BODIE CONSOLIDATED MINING CO. this day levied assessment No. 3 of 50 cents per share, delinquent September 10th. Sale day, October 19th. Same may be paid at the office of Laidlaw & Co., 14 Wall Street.
GEO. W. SESSIONS, Secretary.

WANTED.—A SITUATION; FIFTEEN years' experience in smelting, refining, and assaying lead, copper, and silver and gold. Speaks English, Welsh, French, and Spanish. Highest testimonials as to character and ability. Address,
C. M., Denver, Colo.

TIP TOP SILVER MINING COMPANY.

Location of principal place of business, San Francisco, California.

Location of works, Yavapai County, Arizona Territory.

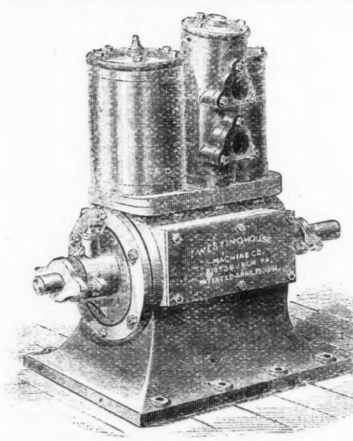
NOTICE IS HEREBY GIVEN that, at a meeting of the Board of Directors, held on the 16th day of August, 1883, an assessment (No. 7) of TWENTY-FIVE (25) CENTS per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the Secretary at the office of the company, Room 44, Nevada Block, No. 309 Montgomery Street, San Francisco, California, on all certificates of stock issued at San Francisco, and at the Farmers' Loan and Trust Company, Nos. 20 and 22 William Street, New York City, on all certificates issued at New York.

Any stock upon which this assessment shall remain unpaid on

MONDAY, THE TWENTY-FOURTH (24th) DAY OF SEPTEMBER, 1883,

will be delinquent, and advertised for sale at public auction, and unless payment is made before, will be sold on MONDAY, THE TWENTY-SECOND (22d) DAY OF OCTOBER, 1883, to pay the delinquent assessment, together with cost of advertising and expenses of sale. By order of the Board of Directors. HENRY DEAS, Secretary.

Office: Room 44, Nevada Block, No. 309 Montgomery Street, San Francisco, California.



# The Westinghouse Automatic Engine.

THE PROOF OF THE PUDDING IS THE EATING!

## LIST OF SALES FOR JULY, 1883.

| | |
|---|---|
| Hussey, Howe & Co. Rolling-Mill, Pittsburg, Pa. | 125 H. P. |
| Oliver Bros. & Phillips, Wire-Mill, " " " | 65 " |
| C. H. Hobbs, Saw-Mill, High Point, N. C. | 65 " |
| American Certaldo Marble Co., Pittsburg, Pa. | 65 " |
| Mutz & Cassidy, Planing-Mill, Ferris, Tex. | 50 " |
| Blakeman & Dobson, Planing-Mill, Rockford, Ill. | 50 " |
| C. L. Blakeslee, Planing-Mill, Schenectady, N. Y. | 50 " |
| P. M. Brown, Flour-Mill, Mill Bridge, N. C. | 50 " |
| Johnson & Caldwell, Oil-Mill, Hillsboro, Tex. | 40 " |
| W. W. Cloud, Saw-Mill, Blythewood, S. C. | 40 " |
| Utica Match Co., Utica, N. Y. | 40 " |
| C. C. Ball, Saw-Mill, Alexandria, La. | 40 " |
| Agard & Co., Flour-Mill, Rockford, Ill. | 40 " |
| Cornish & Curtis, Planing-Mill, Ft. Atkinson, Wis. | 40 " |
| G. H. Blood, Oil-Mill, Pine Bluff, Ark. | 30 " |
| Henry D. Mentzle, Paper-Mill, Ellicott City, Md. | 30 " |
| C. H. Parmalee, Stamp-Mill, Dadeville, Ala. | 30 " |
| J. W. Bullock, Ginning, Calhoun, Ala | 30 " |
| Barr & Peterson, Saw-Mill, Portland, Oregon | 30 " |
| Hudson Lumber Co., Hudson, Wis. | 30 " |
| B. F. McClenden, Ginning, Alvarado, Tex. | 30 " |
| Stonewall Mfg. Co., Cotton-Mill, Enterprise, Miss. | 20 " |
| John R. Miller & Co, Hat Manufactory, Reading, Pa. | 20 " |
| Yale & Towne Mfg. Co., Cranes, Stamford, Conn. | 20 " |
| W. Burgis, Printing, Chicago | 20 " |
| S. H. Ferguson, Ginning, Franklin, Tex. | 20 " |
| H. J. Burton & Co., Electric Light, Minneapolis, Minn | 20 " |
| Niles Paper Mill Co., Niles, Mich. | 20 " |
| S. B. Newman, Ginning, Port Sullivan, Tex. | 20 " |
| J. G. Powledge, Ginning, Aubrey, Tex. | 20 " |
| C. & H. N. Talley, Ginning, Fairfield, Tex. | 12 " |
| Indianapolis Malleable Iron Co., Indianapolis, Ind | 12 " |
| Muhlenberg & West, Machinists, Reading, Pa. | 12 " |
| S. F. Haviland, Planing-Mill, Calera, Ala. | 12 " |
| S. R. McCarty, Ginning, Calvert, Tex. | 12 " |
| W. W. Cook, Ginning, Fort Valley, Ga. | 8 " |
| G. W. Parsons, Rotary Pump, Salisbury, Md. | 8 " |
| J. D. Malone, Ginning, Bethel, Tex. | 8 " |
| John C. Wootten, Philadelphia, Pa. | 4 " |
| Steamer Josie Harry, Electric Light, Memphis, Tenn. | 4 " |
| Steamer Maggie Burke, Electric Light, Mobile, Ala. | 4 " |
| Noah Mitchell, New York | 4 " |
| Jacksonville Gas Co., Jacksonville, Ill. | 4 " |
| Total | 1,239 H. P. |

**Over 11,000 Horse-Power Now in Use.**

Send for Illustrated Circular and Reference List.

The Westinghouse Machine Co., Pittsburg, Pa.